SCIENTIFIC AMERICAN

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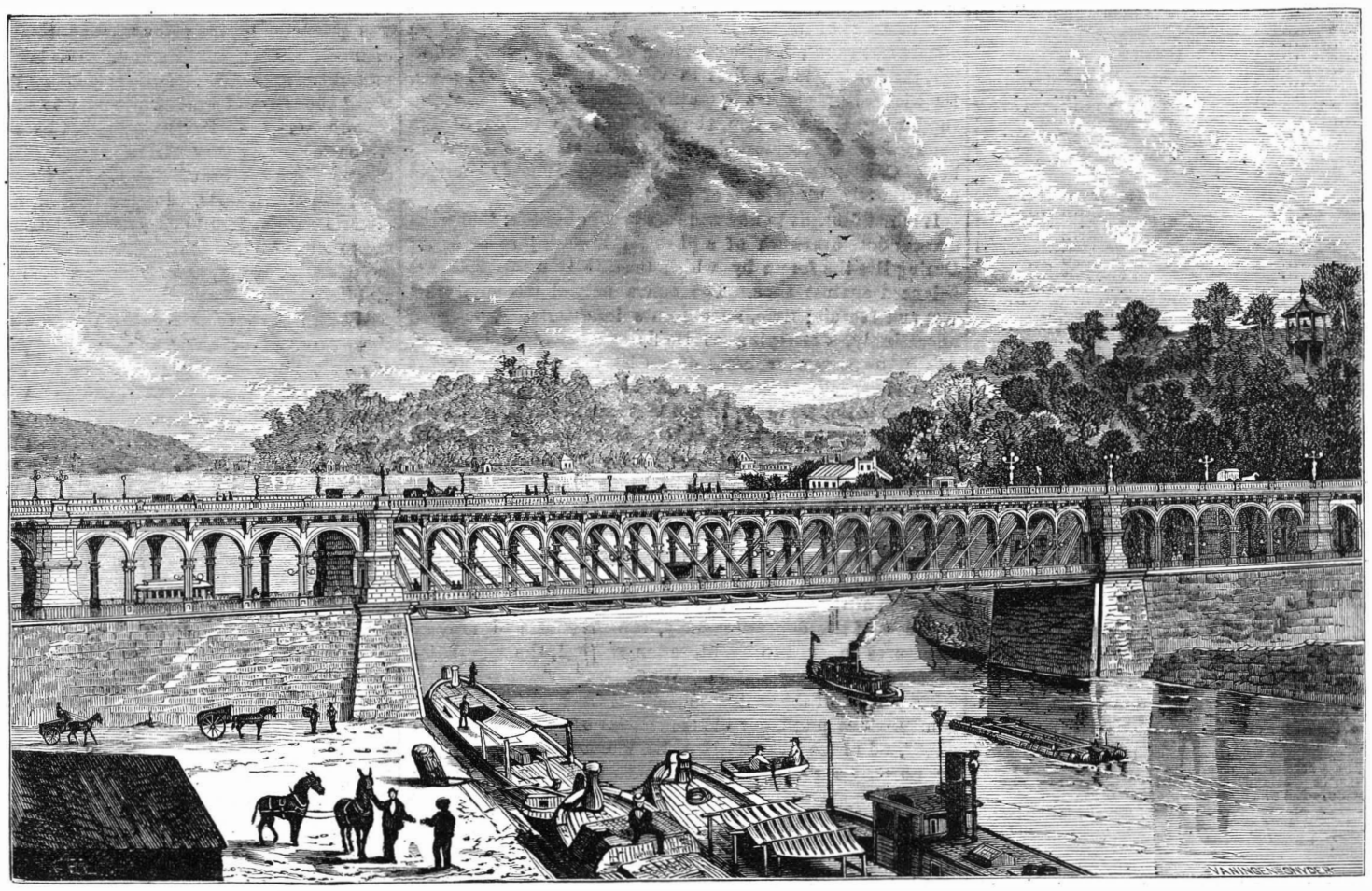
A NEW BRIDGE IN PHILADELPHIA.

The river Schuylkill, at Philadelphia, is becoming renowned for the many handsome structures which cross it. Whatever other attractions the good city of brotherly love may boast, it certainly possesses more beautiful bridges than any other city on this continent. The Market street bridge, recently destroyed by fire, is to be replaced by one of the most solid and ornamental structures in the country. The Girard Avenue bridge, an engraving of which appeared in these columns some time ago, has attained wide celebrity; and a very excellent specimen of modern bridge architecture has recently been completed at Callowhill street, replacing the historic wire bridge, which was one of the earliest suspension bridges in this country. It is from the design of J. H Linville, Esq., C. E., President of the Keystone Bridge Company, by which corporation the bridge was erected. It consists, as will be seen in our engraving, for which we are indebted to the *Polytechnic Review*, of one span only, 350 feet in length; there is a span of 80 feet over Callowhill street, five arched colonnades on the east side of 105 feet, ten on the west side of 230 feet; a bridge over 30th street of 90 feet; seven spans of plate girders, 300 feet; span over the Pennsylvania Railroad, 140 feet; total 1,295 feet. The upper floor of the bridge is 32 feet above the lower roadway, and is 48 feet wide; the roadway is 32 feet wide, and the sidewalks 8 feet each. The lower floor is 50 feet wide, accommodating a roadway and two sidewalks.



CALLOWHILL STREET BRIDGE, PHILADELPHIA, PA.

On the eminence on the right of the picture is situated the main reservoir of the Fairmount water works; and descending this hill to the river side, the tourist will pass the structures containing the wheels and the pumps which lift the water from the river and force it up into the reservoir. The wheels are worked by water brought from the dam (which crosses the river just below the hill shown in the center of the illustration) by a canal.

About Scarecrows.

Now that the planting season is at hand, we have no doubt but that many a farmer will rummage through his garret to find the cast-off garments, which, stuffed with straw, are to be set up in the cornfield to warn off the marauding crow. We have never had much faith in this artifice. Crows are possessed of much more wisdom than is generally credited to them; and while an immovable bundle of rags may drive them away for a short time, we believe that eventually they discover the humbug, as we have seen the birds complacently picking up young corn almost within the shadow of as an elaborate a stuffed scarecrow as ever was erected. We, however, have heard suggested a couple of plans which are calculated to intimidate even the boldest of these birds; and as they are easily carried out, perhaps our farmer readers may make use of them. The first and best is a suspended looking glass. Take two small cheap mirrors, fasten them back to back, attach a cord to one angle, and hang them from an elastic pole. When the glass swings in the wind the sun's rays are reflected all over the field, even if it be a large one; and even the oldest and bravest of crows will depart precipitately should one of its lightning flashes fall on him. The second plan, although a terror to crows, is especially well suited to fields subjected to the inroads of small birds and even chickens. It involves an artificial hawk made from a big potato and long goose and turkey feathers. The maker can exercise his imitative skill in sticking the feathers into the potato so that they resemble the spread wings and tail of the hawk. It is astonishing what a ferocious-looking bird of prey can be constructed from the above simple materials. It only remains to hang the object from a tall bent pole, and the wind will do the rest. The bird makes swoops and dashes in the most headlong and threatening manner. Even the most inquisitive of venerable hens has been known to hurry rapidly from its dangerous vicinity, while to small birds it carries unmixed dismay.

Singular Explosion.

Mr. J. M. Knapp, foreman at Pioneer Tunnel, St. Louis, Cal., in commenting on our account of the explosion of a bucket of water, published on page 81 of our current volume, states that a similar accident happened in the works under his charge. Cartridges of Hercules powder are there usually stood round a bucket of hot water to thaw them out, as they cannot be exploded when frozen; and a helper put a bucket of cold water (an iron bucket, we presume) on the fire, when a violent explosion took place. It is surmised that a portion of the powder may have adhered to the bottom of the bucket. The former accident may have arisen from a similar cause.

Electricity as an Aid to Egg Hatching.

The *Olstereinische Landwithschaftliche Wochenblätter* states that Dr. Virson, Superintendent of the Italian experimental silk farm at Padua, has discovered that the hatching of silkworm eggs, of suitable age, may be accelerated by a period of 10 or 12 days, and a yield of at least 40 per cent of silkworm caterpillars secured, by exposing the eggs to a current of negative electricity from a Holtz machine for a space of 8 or 10 minutes. It is suggested that the same method might perhaps prove useful in promoting the hatching of hens' eggs and in hastening the germination of various seeds.—*Quarterly Journal of Science.*

A Solar Phenomenon.

Mr. James Cassidy, of the United States Signal Office, Milwaukee, Wis., reports the occurrence, on March 13, of a remarkable exhibition of parhelia or mock suns, lasting from 2:30 P. M. to 3:10 P. M. The sky was covered with a whitish haze, and the prismatic colors on one of the parhelia were well developed. The other parhelion moved away from the sun in a circular direction towards the west, and continued to do so till it faded away

A New Mode of Hospital Disinfection.

Dr. John Dougall, of Glasgow, Scotland, has recently made the important discovery that, when organic matter undergoes decomposifion in the presence of an alkali, the putrefactive process is induced, and that this takes place much more readily than when organic matter undergoes decomposition in the presence of a neutral substance; but when organic matter undergoes decomposition in the presence of an acid, the fermentative process is induced, accompanied by a not unpleasant moldy aroma and innocuous products. These conclusions Dr. John Day, of Geelong, Victoria, has been led to consider with relation to their bearing upon the outbreaks of pyœmia, erysipelas, and puerperal fever in hospitals, and he reaches the opinion that such diseases may directly be traced to the alkaline walls, alkaline ceilings and alkaline floors (the latter rendered alkaline by soap) with which the patients are environed. Such diseases hitherto, we may remark, have been considered due to ferments in the air, to bad ventilation, to uncleanliness, and even to the poisoning of walls by organic effusions; and various plans have been suggested for their prevention, among which were coating the walls with silicate of soda and even with solid sheets of glass.

Dr. Day's plan, however, differs from any yet broached, and we take a description of it from a pamphlet for which we are indebted to him. The philosophy of the method is the generation of peroxide of hydrogen. All substances which spontaneously generate this at the same time require an acid reaction. On the other hand all alkalies destroy peroxide of hydrogen, and, when added to those substances which spontaneously generate it, prevent its formation. Thus it would seem that acids are the natural allies of peroxide of hydrogen, for they are not only simultaneously generated, but they give it stability and act in concert with it as deodorisers and disinfectants.

In order to generate the peroxide, and at the same time to abolish the alkaline surroundings, Dr. Day proposes to rub hospital walls smooth and coat them with a varnish composed of paraffin and oil of turpentine; or they may be covered with silicate paint and then rubbed down and varnished. The floors he brushes over with equal parts of gasoline and boiled linseed oil, to which a little benzoic acid has been added, and, when dry, polishes them with a thick paste composed of beeswax and turpentine, with benzoic acid added in the proportion of 2 drachms to the pound. Boards prepared in this way, he considers permanently disinfected. The gasoline, linseed oil and oil of turpentine all get imbedded in the wood and generate peroxide of hydrogen; the benzoic acid is added on account of its great power of destroying all the forms of lower organic life, and the wax is of course used for the purpose of combining these substances and affording a polish.

AN excellent sedative water for external application, for bruises or aches of any kind, is composed of ammonia 2 ozs., tincture of camphor 2½ drachms, common salt 2 ozs., and water 2 pints. Mix and dissolve without heat. This is largely used in France, and is sold this country under a patent medicine name. It is an excellent liniment for cattle when strengthened by the addition of 10 drachms more ammonia

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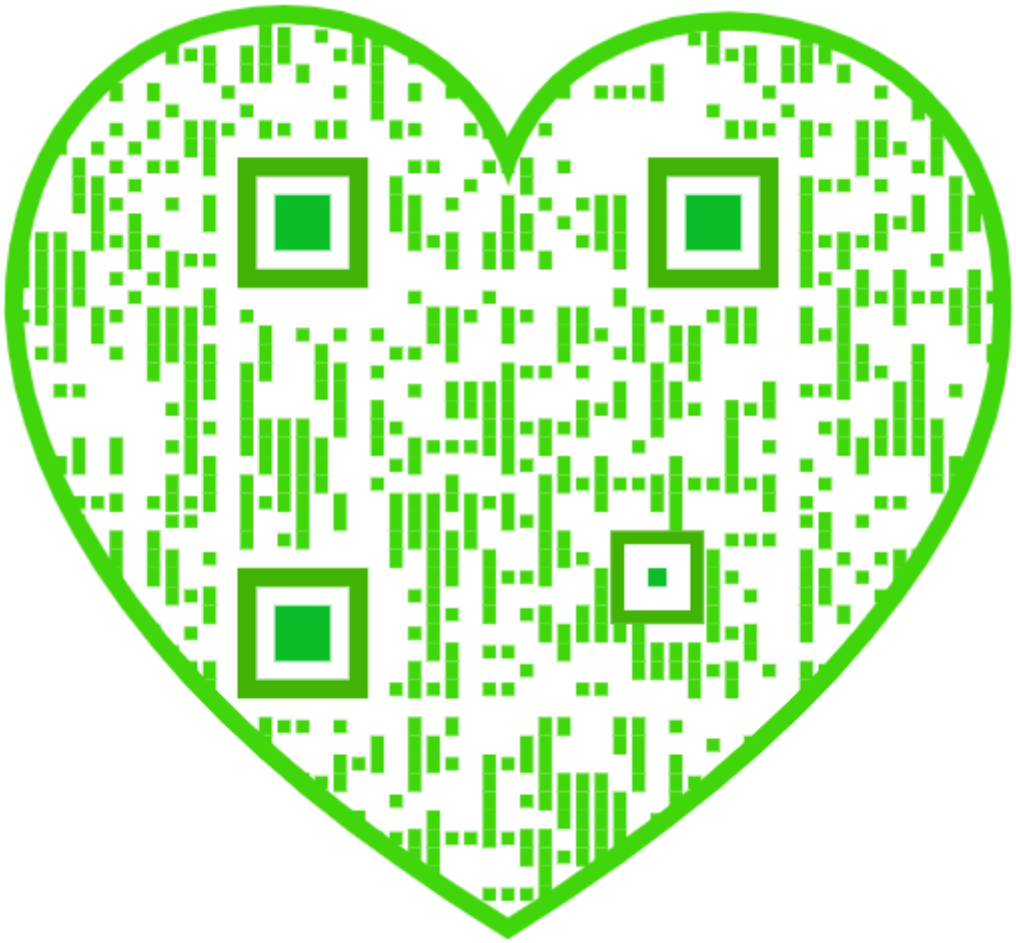

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NEW YORK, SATURDAY, APRIL 29, 1876.

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THE SCIENTIFIC AMERICAN SUPPLEMENT.

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Laundry Blue.

A good washing blue is made as follows: Make a solution of prussiate of potash, 2 ozs., and another of protosulphate of iron, 1 oz.; add the second gradually to the first, until the precipitate almost ceases to fall, then strain through linen, add water, add continue the washing until the blue color begins to dissolve in it, when it may be at once dissolved in distilled water and dried.

THE PRACTICAL EFFECTS OF PHYSICAL STRAIN.

Dr. B. W. Richardson, in his recent admirable work on the "Diseases of Modern Life," devotes a chapter to a subject to which we have repeatedly alluded, and to which, in view of the athletic competitions to occur during the Centennial, the attention, not only of those in training for such contests, but of those who favor athletic sports in all forms, may well be directed. We mean disease induced from physical strain, physical overwork in short, which too often reduces the fairest specimens of muscular humanity to abject wrecks. Dr. Richardson brings to the consideration of this important topic a variety of new thoughts and suggestions, and these all tend to show, first that excessive physical culture is useless, and second, that it is hurtful. The first question which he places before us is: "Do these arts contribute to the health and vitality of a race, either collectively or individually: that is to say, are they necessary in order that a race may obtain the means of subsistence, and (whether necessary or unnecessary) do they contribute to the longevity and tenacity of the life of the men or race through whom or through which they are represented? He first points out that, in a nation so uncivilized as to be obliged to trust to individual force alone for its means of life, no physical culture can be too high or too highly prized; then he shows that in a later age, when none but brute power is at man's service, the predominace of the physical over the mental faculties is still natural. But finally, removing the doctrine of necessity and separating the individual from the community, the picture is reversed. There is no evidence anywhere, he asserts, that the greater culture of the physical strength has favored the longevity of the individual or the vital tenacity of a race. All the observations handed down to us by the physicians of the Greek, Roman, Arabian, and Italian schools, reinforced by the vital statistics of modern France and Prussia, point unmistakably to the fact that in each country, within its own population, the value of life is influenced to the favorable side by the reduction of physical expenditure. A most curious instance is afforded in the history of the Jewish race, in which as a people there has never been a vestige of studied development of physical capacity. And yet the broad truth stands forth that, despite centuries of oppression and suffering, the Jewish is the first in vitality of all civilized races. Dr. Richardson gives a quantity of statistical information supporting this assertion, showing that the period of life among Jews is considerably longer than among a like number of Christians, and the causes, he says, are simply summed up in the term "soberness of life."

It is not difficult to find answers to the question: "In what manner does overwork of a physical kind injure or kill?" During life the forces by which the life is manifested are balanced against time. The active animal machine must rest and recruit; time, an absolute immateriality, flows on unceasingly, destroying as it flows silently and surely. Again, the powers or forces of the body are limited by the size and capacity of the organism. If the force put forth in a certain period be greater than that which ought to be put forth in that period, the extra force is expended at the expense of the organism itself, and, by so much as is lost in any present effort, will be so much shortened in the future. For the body is not constituted to make up time against the slightest breath of force it has once lost. Were it so, the problem of renewal of life would be solved.

Generally speaking, physical overwork injures by the destruction of those parts of the body on which the involuntary acts of life depend, namely, the muscles and nervous structures engaged in the digestion of food, the circulation of blood, and the respiration. When these organs fail, every other portion of the system dependent on these likewise succumbs. The particular characteristics of the changes induced, and of the work itself which induces such changes, are by no means complicated; and such as are noted by Dr Richardson are well worth examination, since they are the results of his own matter-of-fact observation.

The first disease mentioned is aneurism of the aorta, the large blood vessel which rises from the left side of the heart to convey arterial blood to the body. Its cause is a simple mechanical result. The heart during violent exertion (as in rowing spurts), working at high pressure, drives ahead a current of blood which, instead of making its course in steady circuit through the aorta, is brought back by concussion, and falls like a water hammer at the place where the semi-lunar valves prevent its return to the heart. This mechanically injures the wall of the artery, which loses its elasticity; and eventually the resilient tube becomes a passive pouch, ready to give way upon some extra exertion, to let out the contained blood and so cause instant death. In four cases, the author has found life terminated in this way.

The second injury is wearing out of the heart. This is common to persons who practice physical exertions, not violently but persistently. The right ventricle of the heart, which maintains the circuit of blood through the lungs, is much thinner than the ventricle on the left side, which carries the blood over the body. If this ventricle, which drives some 18,750 lbs. of blood in twenty-four hours, be overtaxed, it must necessarily weary; and as the heart not only supplies the rest of the body but also itself with food, it follows that, if it fails to supply the body, it fails to supply itself. This enfeeblement is very gradual. It begins to show itself by slight difficulties in breathing, susceptibility to fatigue, to cold and heat, to congestion of the lungs, and finally to actual organic changes of the lungs, kidneys, or nervous centers, or congestion of the venous side of the body, leading to dropsical effusion and resulting in death.

A third disease is just the reverse of the preceding, and is due to the heart becoming too powerful. Its muscular structure is unduly developed on both sides, its stroke is too severe, and, if the nervous power by which it is governed be not proportionately balanced, it becomes intermittent in its work. These conditions follow closely upon boat and foot races and all fierce competitive exercises. Of the undue action of the organ, the affected person is painfully conscious, the breathing is oppressed, the muscular tone decreased and the end of all is premature disorganization of remote organs and comparatively early death.

"By skillful training," says our author in conclusion, "it is quite true that men may be and are brought to a fine external standard; but the external development is so commonly the covering of an internal and fatal evil that I venture to affirm that there is not in England a trained professional athlete of the age of thirty-five who has been ten years at his calling who is not disabled. He may hold on sustained by a will which cannot bend to defeat; he may win bravely; then win, and only just win; then tie some new antagonist; then lose and, urged by friends whose ardor is damped, retire, but he will soon die. The falling off which has been observed by patrons or admirers before actual failure means not want of skill nor stiffness of joint, but actual overworked, worn-out heart and blood vessels; it means, in fact, now a race for life rather than for fame."

THE VALIDITY OF PATENTS.

The inexperienced purchaser of a patent does not generally appreciate the importance of having its claims examined, and their validity and scope defined by some person experienced in such matters, before parting with his money. It is not unusual for the assignee, just as he is commencing the manufacture of articles under his recently purchased patent, to find that it is an infringement upon some previously issued patent, and that he has not only made a worthless investment, but that he is likely to get mulcted in damages if he proceeds with his manufacture. Cases are continually coming to our knowledge wherein parties have made purchases in good faith, and paid considerable sums of money on the assurances of the patentee and a mere glance at the patent, presuming that all that the drawing of the invention showed was protected by the claims, when, in fact, the point covered was almost infinitesimal. Another manner in which purchasers are sometimes deceived is that the claims, although broad enough and worded properly to cover the invention, contain a single element protected by some prior patent, which covers the very part in the new machine which is necessary to insure its efficiency. The Howe sewing machine patent illustrates this. It protected but little that any of the manufacturers cared to use, except the one small part essential to all sewing machines; and all manufacturers had to pay Howe a royalty, and he derived from that apparently trivial item an immense income.

We therefore recommend any person who is about to purchase a patent, or about to commence the manufacture of any article under a license, to have the patent carefully examined by a competent party, and to have a research made in the Patent Office to see what the condition of the art was when the patent was issued. He should also see that the claims are so worded as to cover all the inventor was entitled to when his patent was issued; and it is still more essential that he be informed whether it is an infringement, as above suggested, or not. Parties desiring to have such searches made can have them done through the Scientific American Patent Agency, by giving the date of the patent and stating the nature of the information desired.

WHAT THEY SAY ABOUT US.

We should be lacking in appreciation of a great deal of kindness did we not occasionally acknowledge a few at least of the good wishes and compliments which our labors call forth. It would be impossible to publish all or even a tithe of our correspondents' good opinions; but the limited number which we make room for may be taken as samples indicating the drift of all. A writer, to whom *Wrinkles and Recipes* has been sent as a premium, says: "I do not send you clubs to be rewarded for it, but I feel it a duty to distribute the SCIENTIFIC AMERICAN among my fellow men, because they cannot benefit themselves any better for the money, and nobody ought to be without the paper." And we, let us add, also feel it a duty, when any one kindly promotes our interests likewise, to serve his, and certainly we can do so in no better way than by presenting him with such valuable works of practical and useful information as the *Science Record* and the volume above named, or with so fine a work of art as "Men of Progress." *Apropos* of this engraving, another writer, who has received it as his premium, says: "Your beautiful engraving 'Men of Progress' came to hand: I am very grateful to you for your kindness, and I will do all in my power to promote the circulation of the SCIENTIFIC AMERICAN."

The SCIENTIFIC AMERICAN SUPPLEMENT is likewise meeting a wonderful share of public approbation. Speaking of the excellent series of illustrated articles on mechanical drawing, now in progress of publication, one writer considers them "worth much more than the subscription price of the paper;" and he adds: "While the SUPPLEMENT is so fine, it in no way lessens the value of the SCIENTIFIC AMERICAN." It enhances the worth of the older journal, we might continue, because, through the large accession of space gained by its pages, we are enabled in both journals to present not only a wider range of valuable information, but to treat the same more elaborately and completely than otherwise would be practicable. One more notice, this time from our excellent illustrated contemporary *In Door and Out*, and we terminate this tax on our modesty. "The SCIENTIFIC AMERICAN," says the editor, "like wine, has gradually grown better and better in its field of usefulness, and today has a circulation

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probably exceeding the combined subscription lists of all mechanical journals in the country." (Let us interrupt to say that it is a fact that the circulation of the SCIENTIFIC AMERICAN and SUPPLEMENT combined is unquestionably larger than that of all other mechanical journals in the world.) "We have read its pages for years, but never with greater satisfaction than the present volume No. XXXIV. To the mechanic it is really indispensable, while it is valuable to everybody."

DEATH OF THE MILLIONAIRE MERCHANT.

The recent death of Mr. A. T. Stewart, the great dry goods merchant of New York city, on April 10, has called forth from a large number of people a variety of curious and often striking anecdotes relating to his early life and struggles, as well as to his habits after he had attained his enormous wealth. Perhaps not again in this generation will any one man accumulate by legitimate trade so immense a sum as he acquired; and it is a natural curiosity which prompts all to examine closely those traits, customs, and habits through which the great fortune was amassed. Mr. Stewart was born in Belfast, Ireland, in 1803. His parents were well-to-do people, but died while he was quite young, leaving him under the care of his grandfather. He was well educated, and had begun to prepare for the ministry, when his grandfather's death caused him to change his plans, and at the age of 20 to embark for America. Here he started as a school teacher, and was pursuing that calling when he lent a small sum to a friend who desired to open a dry goods store. The friend failed, and Mr. Stewart, partly from a desire to enter trade, and partly in order to protect his investment, took charge of the store. Soon after, he returned to Ireland to obtain his patrimony, some $3,000, and this he laid out in cotton trimmings for dresses, which were then very fashionable in New York In Belfast he purchased the goods at some two pence sterling a pound, and afterwards sold them in this city at two shillings a pound, and this stroke of success, he always stated, convinced him "that money could be made in the dry goods business." Of Mr. Stewart's honest and rigidly fair dealing in the little store in which he began, there are abundant stories. "What do you mean by saying what you know to be untrue?" he once angrily demanded of a clerk who was exercising all possible powers of persuasion to convince a woman that the colors in a piece of calico would not fade. "The calico won't wash; she'll demand her money back, and she'll be right. I don't want the goods represented for what they are not." It was this perfect honesty toward all his customers that was Mr. Stewart's most prominent characteristic, and it was his invariable custom, when questioned as to his explanation for his great success, to reply with great emphasis: "Truth, truth is the talismanic word; and if I have one earthly wish or desire greater than another, it is that in this respect my example may be commended and followed by young men entering into business, and especially by young merchants."

On this firm basis of truth and honesty he reared his gigantic transactions: not by bold ventures or colossal speculations, but through steady application, perfect organization, and minute attention to every detail. The discipline in his establishment was rigid. "Do you see all these people about here?" he once asked of Mr. Peter Cooper, pointing to the scores of busy salesmen and ushers in his great retail store. "Well, there is'nt a man of them who is allowed the slightest discretion. Every one is taught to do precisely and simply what he has been told. He is a machine working by rote and according to rule." Haggling over prices was to him an especial abhorrence. There was but one price for everything and everybody; but on the other hand he was no believer in holding for high prices, when by lower ones he could realize promptly. An old employee of his recently told us that Mr. Stewart seemed to watch each individual class of goods "as if his fortune depended on them only." If in making his rounds through either store, he noticed an unusual quantity of any material on hand, he would question the salesmen closely about it; and if he found its sales slow, he would mark down the price to such figures that its very cheapness would attract customers. It is said, moreover, that he knew the contents of his warehouses better than those in his employ; while he watched the latter much more closely than they ever imagined. If he saw too much jewelry worn, he deemed it a snspicious sign, and placed the wearer under special surveillance. "He never spoke to me but once," says an old clerk, "and then it was when I tore a piece of wrapping paper roughly across. He came and told me that I should have folded it and made even edges. People," he said, "did'nt like to get shiftless bundles." At another time, a clerk wound a package with an extra turn, of cord. Before he could cut the string, Mr. Stewart quietly took the bundle from him and unwound the extra turn, saying: "Never waste even a piece of string; waste is always wrong."

The principles illustrated by these brief anecdotes carried him from the possession of the humble little store to that of his magnificent buildings on Broadway in New York, to emporiums in Boston, Philadelphia, Paris, Lyons, Manchester, Berlin, Glasgow, Chemnitz, Belfast, and Nottingham, and to mills in various parts of the United States.

Gigantic as was the business he controlled, Mr. Stewart likewise managed real estate operations of sufficient magnitude to be a life's work for an ordinary man. In New York city alone, he was the absolute owner of over one hundred pieces of improved property, free from encumbrances and valued at about ten millions of dollars. This magnificent estate included, besides his two stores, two theaters, the Metropolitan Hotel, the Working Women's Home (an immense iron building on Fourth avenue), his superb marble residence on Fifth avenue, the finest private dwelling in the country, besides dwellings and stores scattered in the most desirable quarters of the city. In Saratoga, he owned the enormous Grand Union Hotel. Probably his greatest real estate scheme was the founding of Garden City on Long Island, a work of genuine philanthropy undertaken in order to supply cheap and good homes for those unable to pay high New York rents. He bought a tract of land on Hempstead Plains, ten miles long and one mile wide, and built a city as he would a single house. Gas and water works and a railroad to New York were begun with the foundations of the houses; and when some forty fine dwellings were complete, he offered to rent, not to sell, them at prices ranging from $1,200 to $250 per year, and only a few weeks before his death he contracted at one time for thirty new houses.

Personally Mr. Stewart was of a retiring disposition, free from the ostentation which might legitimately follow the possession of such vast wealth; and while philanthropic and charitable, he was inclined to temper his benevolence with prudence. Miscellaneous appeals for charity he heeded little; but on the other hand, cases recommended to him by those in whom he had confidence met bountiful attention. With seven thousand employees to control, rigid impartiality and discipline was a necessity; but outside the business connection, there were many who felt his aid in time of need and suffering. The world knows nothing of such good works, for he was the last to publish them. It is reported that he was inclined to superstition, and was a firm believer in Baron Rothschild's maxim: "Never have anything to do with an unlucky man;" but the many anecdotes based on this are hardly reconcilable with his character. An educated man himself, he possessed an educated man's taste. He used to say that, if ever he retired from business, he would "go to school," for he loved study for its own sake, and in the midst of all his concerns he found time to keep up his knowledge of classics and the languages, and to read his fifty lines of Homer or Virgil in the morning before going to his office. He was a liberal patron of the arts, and some of the most celebrated of modern paintings are in his private gallery. It was he who recently paid $60,000 for a single picture by Meissonier, and in the same apartment are works by Rosa Bonheur, Zamacois, Gérome, and other great artists, besides statuary, the whole valued at half a million dollars.

Mr. Stewart has, by his will, bequeathed the whole of his immense property to his wife, with the exception of a number of small bequests to relatives, old employees, and servants, and the magnificent legacy of $1,000,000 to Judge Hilton, his counsel, business manager, and adviser. No reference is made in the instrument to any appropriation of money to public purposes, save a recommendation to Mrs. Stewart to carry out such charitable undertakings as the testator had begun.

Mr. Stewart's death is a public loss. Few men could have controlled his vast wealth so as to benefit the public as he did; for apart from the direct advantage occurring to all from his colossal business, there stands the grand example of honesty, industry, and perseverance, crowned with a reward gigantic beyond all precedent.

ANIMAL PARASITES.

Professor Van Beneden, of the University of Louvain, France, has recently written an interesting little work entitled "Animal Parasites and Messmates," in which he has contrived to compress a great deal of curious information regarding a subject much more extended than the reader not versed in modern progress of natural history would suppose. He divides the strange creatures of which he treats into three classes: first, messmates, or those who join others to obtain a living or a home or protection; second, mutualists, or animals which live on each other without being either parasites or messmates; and third, the parasites, whose profession it is to live at the expense of their neighbors, and whose only employment consists in taking advantage of them, but prudently, so as not to endanger their lives.

While it would be impossible here to follow the writer in the numerous distinctions which he draws among the members of these different classes, it will perhaps prove interesting to note a few of the most odd and novel peculiarities of the creatures belonging to each. There is a fish, he tells us, called the *holothuria*, which is a living boardinghouse for the *fierasfer*, an eel-like animal. The latter is lodged in the digestive tube of his companion, and, without any regard for the hospitality which he receives, seizes on his portion of all that enters. The angler or *beaudroie* of the Mediterranean often harbors, in the bronchial sac, a kind of eel, which is abundantly able to take care of itself, but prefers to live a life of idleness and share its host's spoils. The shark is accompanied by the pilot fish, which does not, as is often reported, exist on the leavings of his larger companion, but on his own industry, and doubtless finds some advantage in piloting his neighbor.

Another remarkable fish, the *remora*, literally moors itself to the body of the shark, thus converting the latter into a vehicle which carries him about without exertion on his part. When he becomes hungry, he lets go and hunts for prey wherever he may happen to be. This tenacity of the remora in attaching itself is taken advantage of by the fishermen of Mozambique Channel, in order to capture turtles and large fish. They pass through the tail of the remora a ring to which a cord is attached, and then send it in pursuit of the first passer-by which they consider worthy to be caught. The fish holds on to its prey so firmly that it only remains to haul victim and captor in by the line.

There is a crab, of the family of the *maidæ*, which conceals itself in the substance of a polypidom; it is common in the Viti Islands, in company with a gasteropod mollusc, and both of them assume the exact color of the polypidom. This is a new kind of mimicry. Another crab appropriates a sea anemone to form a living cloak to hide it from view, in order that it may spring out from its ambush to attack prey. Remarkable marine creatures are the *birgi*, a kind of crustaceans which grow very large, and conceal their abdomens no longer in a shell, but in the crevices of rock. In the East Indies they remain on land, and even climb trees. They have so much strength in their pincers that it is related that one, while stretched on the branch of a tree, "raised a goat by the ears." A family of isopods are rather dangerous messmates, it would seem, for they cut into the walls of their host's stomach and live like Sybarites on its contents.

The most interesting fixed messmates are the cirrhipedes, which cover the skins of whales, which they never quit after once choosing their abode. Each whale lodges a peculiar species; so that the crustacean messmate is a true flag, which indicates, in some respect, the nationality. It would not be without interest for voyagers who are naturalists to study these living flags.

Among the mutualists may be mentioned the ticks, one generic division of which has twenty species, one of which lives on the dog, another on the cat, and another on the ox. Fishes harbor crustaceans instead of ticks, and these sometimes multiply so rapidly that they cover their post as though they took the place of scales. The cod gives lodging to a species of very beautiful shape, which in its turn affords a resting place for a still smaller organism. In the midst of the eggs of the lobster, there lives an animal of extreme agility, which our author considers the most extraordinary being ever subjected to the eyes of a zoölogist. "Let us," he says, "imagine a clown in a circus, with his limbs as far dislocated as possible, displaying tricks of strength and agility on a heap of monster cannon balls which he struggles to surmount: placing one foot formed like an air bubble on one ball, the other foot on another, alternately balancing and extending his body, folding his limbs on each other, or bending his body upwards like a caterpillar: and then we shall have but an imperfect idea of the attitudes which it assumes, and which it varies incessantly."

There is no organ which is sheltered from the invasion of parasites; even in man, *cysticerci* have been found in the interior of the lobes of the brain, in the eyeball, in the heart, and in the substance of the bones, as well as in the spinal marrow. Each kind of worm has also its favorite place; and if it has not the chance of getting there, in order to undergo its changes, it will perish rather than emigrate to a situation which is not suitable to it. One kind of worm inhabits the digestive passages; another occupies the *fossa* of the nose; a third, the liver or the kidneys. Each animal has its proper parasites, which can only live in animals having affinity to their peculiar host. Thus the *ascaris mystax*, the guest of the domestic cat, lives in different species of *felis*, while the fox, so nearly resembling in appearance the wolf and the dog, never entertains the *tænia serrata*, so common to the latter animal. The same host does not always harbor the same worms in different regions of the globe. Thus the large tapeworm of man, called *bothriocephalus*, is found only in Russia, Poland, and Switzerland; a small tapeworm, the *tænia nana*, is observed nowhere except in Abyssinia, and, strange to say, the natives consider their absence from the body a sign of ill health; the *anchylostoma* is known only in the south of Europe and the north of Africa, the *filaria* of Medina in the east and west of Africa; and the *Bilharzia*, a terrible worm, has been found only in Egypt.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE STARTING OF THE GREAT ENGINE AT THE CENTENNIAL.

Pursuant to the terms of the contract between the Centennial commission and the builder of the Corliss engine which is the principal motor at the Exposition, the great machine was started running on April 10. Steam was generated in four of its twenty boilers; and when a pressure of fourteen pounds was reached, everything was in readiness to open the throttle. Director General Goshorn stationed himself between the two cylinders, gave the signal, and the immense walking beams slowly began to move. The operation is quite noiseless and easy, despite the huge dimensions of the engine; and the builder may be congratulated on the successful completion of a work creditable alike to himself and to the Exposition.

EFFECT OF THE SEASONS ON THE BODY.

The curious fact has recently been pointed out by Dr. B. W. Richardson that the changes of the seasons have a potent physical influence upon the body. Some years ago, in a convict establishment in England, a number of men were confined amid surroundings (of clothing, room, food, etc.) practically the same for each individual. The medical superintendent of the jail undertook investigations, extended over some nine years, and during which over 4,000 individuals were weighed. It was found that during the months of winter the body wastes, the loss of weight varying in increasing ratio: that during summer, the body gains, the gain varying in an increasing ratio: and that the changes from gain to loss and from loss to gain are abrupt, and take place, the first at the beginning of September, and the second at the beginning of April. This is shown in the following figures, indicating the ratio of loss or gain: Loss: January 0·14, February 0·24, March 0·95. Gain: April 0·03, May 0·01, June 0·52, July 0·08, August 0·70. Loss: September 0·21, October 0·10 November (exception) a slight gain, December 0·03.

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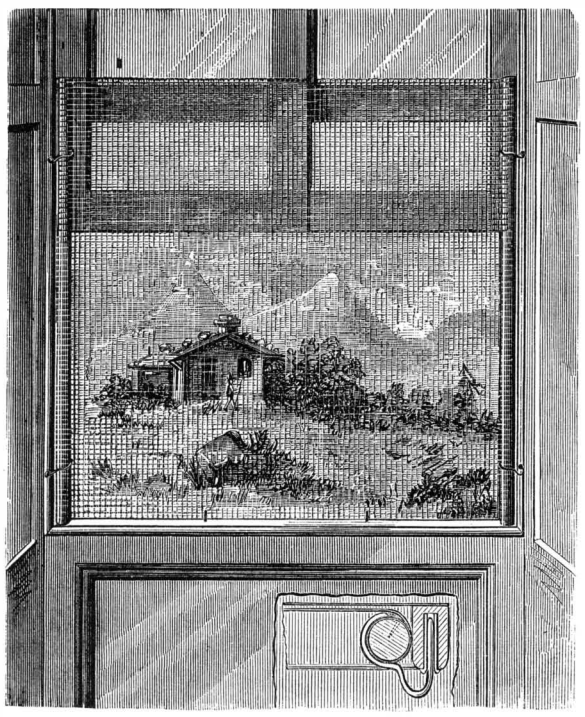
IMPROVED WINDOW SCREEN.

The annexed engraving represents a wire cloth screen, which is adjustable without alteration to windows of differing widths. It is an efficient guard against the ingress of flies, mosquitoes, etc., is durable, and not costly. It consists of a broad band of wire cloth secured to rollers as shown.

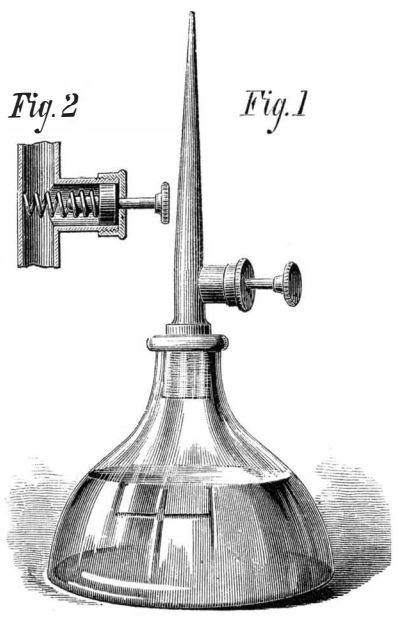


These rollers, about which the cloth is wound so as to adapt it to the width of the window, are held in place by two brass wire clasps, arranged one on each side, and constructed as represented in the sectional view below. On large windows four such clasps would be used. The shanks of the clasps are inserted in closely fitting metal sockets, which last can be easily placed in the window casing by the aid of a gimlet or bradawl. The device is exceedingly simple and very easily adjusted.

Patented November 16, 1875. For further particulars regarding sale of patent or portions of the same, or relative to purchase of screens, address W. D. Walbridge, 322 Dagraw street, Brooklyn, N. Y.

IMPROVED OIL CAN NOZZLE.

We have occasionally directed the attention of inventors to the fact that some simple adaptation of a glass bottle, so as to render it utilizable as an oil can for sewing machines, is needed, since such a device would probably diminish the cost of the oiling apparatus, and at the same time would admit of selling the oil in the bottle from which it subsequently would be used. Mr. R. H. Hasenritter, of Herman, Gasconade county, Mo., has recently contrived a neat little arrangement for the above purpose, which seems to answer the requirements satisfactorily. The bottle itself may be made in the usual oil can shape, shown in our engraving, Fig. 1, or after any other pattern, since the means of forcing out the oil lies in the nozzle, which is easily inserted in the mouth of the vessel. The inventor simply forms, on an ordinary nozzle, a little cylinder, in which he places a piston sustained by a spiral spring, as shown in the section, Fig. 2. The bottle having been turned so that the oil will run into the nozzle, by pressing slowly down upon the piston the oil is caused to run out gradually, or by a sudden push it is made to escape in a jet or stream.



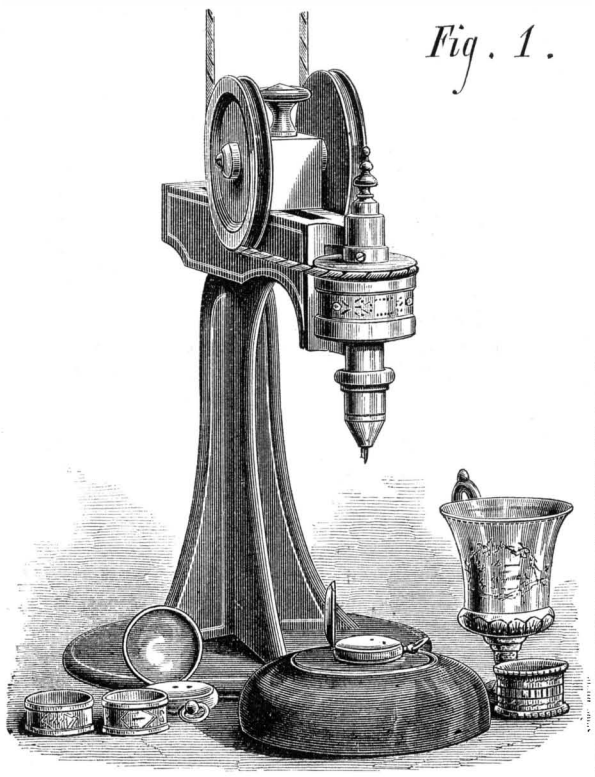
The inventor points out that the device may be used on any kind of oil can now employed in shops, and may prove an advantageous substitute for the usual spring bottom, which is difficult to repair when injured. By making a screw thread on the end of the tapering nozzle, it can be applied to metal vessels having different sized mouths; and thus the nozzle, being complete in itself, can be manufactured for the market independently of every bottle or can. To adapt it for bottles, it is of course only necessary to wind packing about the screw thread so as to cause a tight fit. The inventor, who may be addressed as above, desires to sell the patent in two parts—for glass oilers and for metal oilers, respectively. Patented February 29, 1876.

Temperature Fatal to Animals.

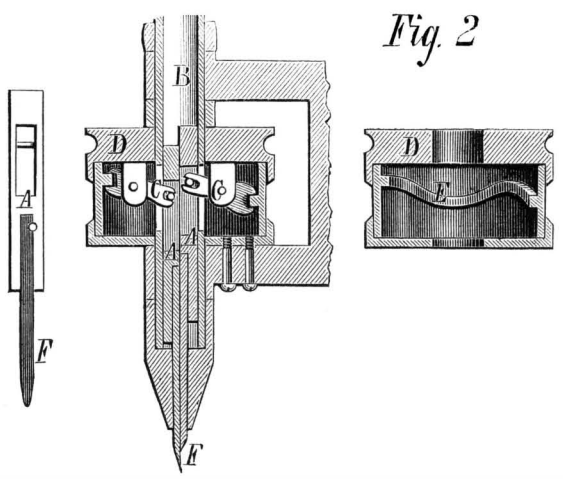
Dr. B. W. Richardson has determined, from observations on man and various other warm-blooded animals, that the increment of heat which proves fatal is from 11° to 12° Fah. above the natural temperature of the animal. In the human subject a steady elevation of temperature to 100° Fah. indicates fever; an elevation to 105° indicates danger; above that, great danger. At 109°, 11° above the natural temperature (98°), the condition is fatal.

ATCHISON'S ENGRAVING AND CHASING MACHINE.

In the accompanying engravings is represented a new machine for making engraved or chased groundwork on gold or plated jewelry, silver, silverplated, or washed ware. It can be applied as well to the lightest plated surface as to solid metal, and will produce beautiful matting, on gold rolled to the thickness of note paper. A perspective view of the apparatus in given in Fig. 1, and the working parts are exhibited in section in Fig. 2.



Two tool stocks, A, are arranged side by side in the hollow revolving mandrel, B, so as to slide up and down freely while being rotated. At C are levers suspended by hangers from the pulley, D, which turns the mandrel. These levers are each connected at one end with a tool stock, and at the other embrace the cam ring, E, which is within the casing. As the pulley revolves, the tool stocks are caused to move up and



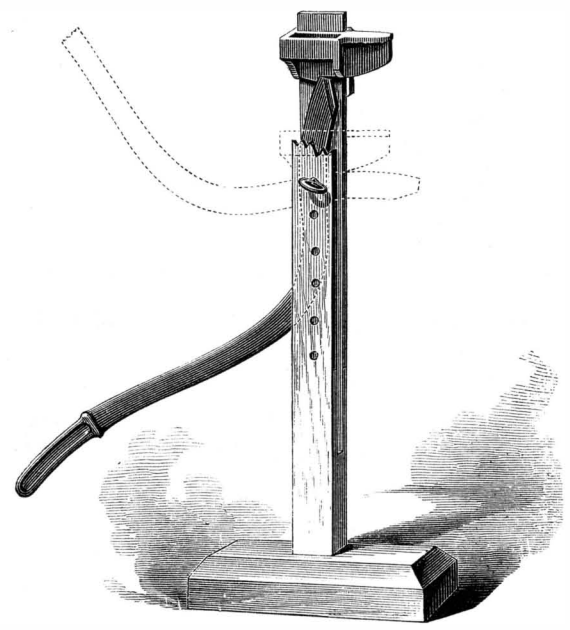
down, so that the tools, F, have a reciprocating as well as a rotary motion. The mandrel is mounted in a bearing attached to a stand, and has guide pulleys, as shown, for leading the belt from above to the horizontal pulley. The engraving tools are easily fitted into and removed from the stock, so that they may be changed in accordance with the kind of work to be executed.

The groundwork is produced on the metal with great rapidity, the tools delivering 5,335 cuts per minute, and the apparatus can be attended by a child. As the sale of jewelry and silverware depends almost entirely upon the ornamentation, it need hardly be added that a machine of this description, making a very excellent imitation of handwork, is one of considerable economical value to the jeweler and plate manufacturer. We are informed that the machine produces fourteen styles of ground work, claimed to be superior to satin, or pearl, or sand blast finish in depth, durability, and beauty. It is also adapted to wood carving, especially for panel work and for the routing of engravers' blocks.

Patented through the Scientific American Patent Agency, March 14, 1876. For further particulars relative to purchase of patent, address the inventor, Mr. R. R. Atchison, Room 8, 383 Washington street, Boston, Mass.

VIBERT'S IMPROVED LIFTING JACK.

Mr. F. C. Vibert, of Hockanum, Connecticut, has patented (November 17, 1874) a simple form of lifting jack, which, while an efficient and useful implement, can be made and sold at a very cheap rate. The standard is of oak, and is fixed above to receive the curved cast iron handle, which is



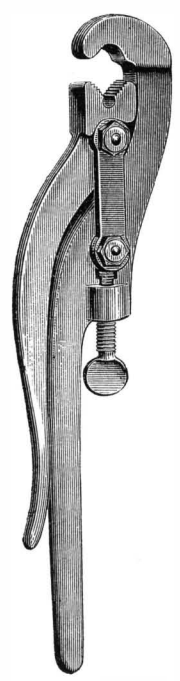
secured by an adjustable pivot. The upper part of said handle is rounded, and takes against a similarly formed portion of the lifting step, as indicated by the dotted lines. This arrangement of parts is one well calculated to apply the leverage of the handle at great advantage, so that, light and simple as the device is, very heavy weights can readily be lifted by it. When the step has reached the summit of the standard, the extremity of the handle steps under it, as shown (the parts being broken away for the purpose), so that the handle forms a firm support for the load. For further information, the inventor may be addressed as above.

Stencilling Materials for Painters' Use.

Stencilling is an art by which the painter can execute ornamental work very quickly. The articles required in making a stencil are a sheet of well sized writing paper, a lead pencil, and a sharp penknife. Fold the paper, allowing the edge of the fold to form the center of the pattern, then draw any desired design, leaving bars to hold the parts together. Place the paper upon a piece of glass and cut out the figure with a penknife. The tool used is a camel's hair brush with hair not over one half inch long, bound with quill and wire on a round wooden handle. The small sizes are preferable. Color mixed with vinegar and sugar will be found best. The paint must be quite thick, and a small quantity only must be taken on the brush, and then well rubbed out on a dry plate before applying it to the work Placing the stencil on the panel as desired, hold it down firmly, and rub over with the brush carefully until the cut portions of the figure are well coated. Then lift off the stencil and the work is completed.

IMPROVED ADJUSTABLE PIPE TONGS.

The novel feature in the improved pipe tongs herewith illustrated is the means of adjusting the movable jaw by the use of the pivoted bar and set screw represented. The arrangement of parts will be clearly understood from the engraving, so that further description is unnecessary. The tongs will perform all the ordinary duties of the implement in gripping pipes and studs, and is especially adapted for brass or other pipes which are liable to be injured by tongs of the usual construction. From the peculiar formation of the jaws, the present device holds the pipe without flattening or cutting it. It will readily be seen that the mechanical movement governing the jaws is such that they will hold without slipping, even, it is claimed, when worn or dull.



Patented through the Scientific American Patent Agency, September 25, 1875. For further information address Macdonald, Box 377, Halifax, Nova Scotia.

MESSRS. HENRY DISSTON & SONS, of Philadelphia, Pa., once said that they would sell American saws in Sheffield, England, and they have carried out their determination by filling orders received from Sheffield for small lots, while orders from Liverpool, England, for quantities up to 100 dozen, have been filled by them. They have received an order for saws for Japan, the Japanese workmen having minutely examined the temper and quality of the steel. This order has been followed by one for 2,000 plane bits.

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BROKEN STONE ROAD-MAKING ---BLAKE'S CRUSHER.

As the present is the period of the year in which the building of new roads and the repairing of old ones are usually undertaken, the practical information below given, relative to road construction and to a standard machine for the crushing of stone for that purpose, will prove of timely interest. Road coverings, says General Gillmore in his recent treatise on "Roads, Streets, and Pavements," have for their object the reduction of the force of traction to the lowest practicable limit, at the least cost for construction and maintenance. They should be composed of hard, tough, and durable materials, laid upon a firm bed, or upon an artificial foundation from which water is excluded by suitable drainage. Roads, as distinguished from paved streets, may be classified with respect to their coverings as follows: 1. Earth roads. 2. Corduroy roads. 3 Plank roads. 4. Gravel roads. 5. Macadam or all broken stone roads. 6. Stone sub-pavement with top layers of broken stone Telford). 7. Same, with the addition of gravel. 8. Stone sub-pavement with top layers of gravel. 9. Rubble stone bottom with top layers of broken stone, gravel, or both. 10. Concrete sub-pavement with top layers of broken stone, gravel, or both. With the six classes into which broken stone enters, we have only to deal; and before passing to a brief consideration of their relative modes of construction, we may refer to a standard machine for the crushing of stone which, for several years, has been in extensive use both in this country and abroad, namely, the Blake stone breaker, manufactured by the Blake Crusher Company, of New Haven, Conn.

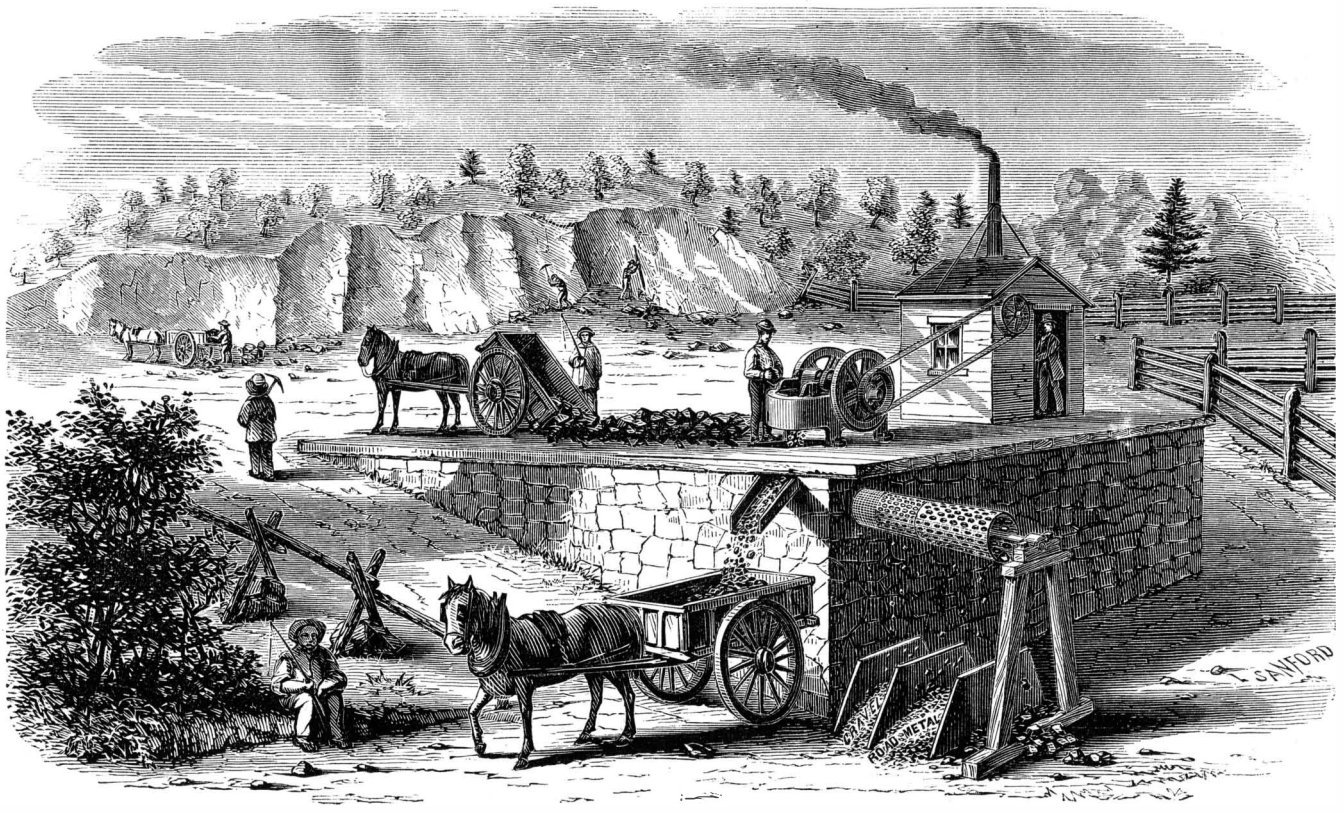

Fig. 1.—BLAKE'S STONE CRUSHER IN OPERATION.

As will be seen from the illustration, Fig. 2, the construction of the machine includes a massive pitman, F, which is caused to ascend and descend through the eccentric, D, on the fly wheel shaft. This motion of the pitman is applied

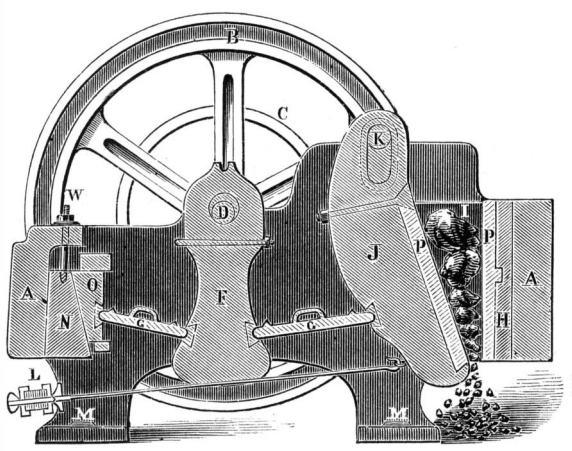

Fig. 2.—BLAKE'S STONE CRUSHER.—SECTIONAL VIEW.

to the toggles, G, one of which presses the movable jaw, J, toward the stationary jaw, H. The jaw, J, when the toggles relax their pressure, falls back, partly through the action of a spring, L. The stone is crushed between the jaws, to which the power is applied obviously to the best mechanical advantage. A method of locating the machine, while in use for breaking stone for road purposes, is represented in Fig. 1. It is placed with its driving engine upon a platform extending from a hillside, and is therefore easily accessible to carts loaded with the stone hewn from the quarry shown in the background. The loads are dumped in proximity to the breaker, and the carts proceed to the spout below, as represented. There they are filled with the broken stone as it escapes from the machine, and are at once driven off to the road bed. While this arrangement avoids considerable handling, still further may be saved by placing the breaker under the platform so that the rocks may be shoveled directly into the jaws, which come on a level with the dumping floor. It is not necessary to plant the machinery close by the ledges. Any point on the route, between the quarries and the streets to be paved, where a good accessible side hill is found, convenient for the erection of the works, will be equally advantageous. The crusher can of course be worked on level ground, but at a great disadvantage in the handling both before and after the crushing, while no means for an accumulation of the product is afforded. Generally, however, it is estimated that there is no way in which the machine can be so economically located and used as that above described. To the right of the platform is shown an apparatus for screening the product and separating it into two or more sizes. This is not a necessary part of the combination, and is sold separately; but in making macadamized roads it is desirable to use the screening device. The machine is constructed of solid castings of great strength, and such of its parts as are liable to wear out may be replaced without difficulty. The proper speed for these machines is about 200 revolutions of the crank per minute. They are made of several sizes, requiring engines of 4 to 12 horse power, and their working capacity varies correspondingly from 3 to 7 cubic yards of broken stone per hour. The best size for breaking road material is one having a capacity to receive stones 8 to 9 inches thick and 14 to 15 inches wide.

Macadam roads, a section of the bed of which is shown in Fig. 4, are constructed of successive layers of stone broken into fragments, the largest of which should not exceed 2½ inches in longest diagonal dimensions. The drainage of the road bed having been provided for by side ditches and (if necessary) by suitable cross drains, an excavation is then made to the sub grade, for the reception of the materials. On made ground it is well to consolidate the bed by ramming. A layer of stone 3 inches in thickness is applied, and spread evenly with a rake. The road is then open to travel in order that it may compacted before more stone is added. This operation may be hastened by rolling, beginning with the light and ending with the heavy roller. Ruts must be carefully raked in as fast as formed. As soon as the surface is well compacted, a second layer of stone of like thickness, with gravel or earth at the wings, is applied and rendered solid as before. The top layer is spread and consolidated in the same manner. The roller should pass over every part of the surface, perhaps a hundred times, and if the weather be dry the materials should be kept damp by sprinkling carts. Finally, a binding layer, about one inch in thickness of gravel or the finest pulverized stone, should be spread over all. When thoroughly consolidated, the finished road surface will not show any tendency to rise up and form a ridge in front of a 9 or 10 tun roller.

The Telford road, Fig. 3, is made with layers of broken stone resting upon a sub-pavement of stone blocks. The lower stones are set on their broadest edges lengthwise across the road, and for a 30 foot roadway are 7 inches deep. The interstices are filled with stone chips firmly wedged. The middle 18 feet is coated with 6 inches of broken stone, 4 inches being first applied and consolidated, and then the remaining 2 inches added. The paved spaces on each side of the 18 feet middle are coated also with broken stone, so as to make the whole convexity of the road 6 inches from the center to the sides. One and a half inches of good gravel forms the top layer. It is a good plan to rest the lower pavement on brushwood or fascines, especially where the soil is loose, in order to give a better support and to avoid ruts.

In localities where material cannot be obtained of sufficient toughness for the top layer of broken stone, the road may be finished with three or four inches of gravel, surmounted by a single top layer of stone obtained elsewhere; or if this plan prove costly, a second layer of gravel alone may be used.

To secure firmness and unity of mass on soft ground, a layer of rubble stones, varying in thickness from 3 to 5 inches, and in width and length from 8 to 10 inches, is sometimes used as a foundation to the Telford pavement. When the Telford plan is not followed, a good road can be made as shown in Fig. 5, in which there is a foundation of 6 or 7 inches of rubble to 10 inches of covering. Where motion of the foundation seems possible, the stones may vary in thickness from 3 to 6 inches, in width or depth from 6 to 9 inches along the middle of the road, and in length from 8 to 18 inches. Even flat cobble stones can be used, mixed in with irregular fragments, and it is better to set the stones on their edges.

Difficulty is often experienced, in wet and elastic subsoils, in keeping a foundation of rubble stones firm and in tact, and in preventing the stones working up and destroying the surface. A remedy is found in the use of hydraulic concrete between the stones, as shown in Fig. 6. The largest stones are laid down side by side and firmly set. The concrete, in which the ballast should be composed of stone fragments not exceeding three quarters of an inch in longest dimensions, is well tamped in

Fig. 6.—RUBBLE STONE AND CONCRETE ROAD.

between the stones. If a thickness of 6 or 8 inches is secured in this manner by one course of stones, this will suffice, and the road may be finished in the usual manner with layers of broken stone or gravel.

The first important matter for a road contractor to consider is the requisite machinery for enabling him to fulfil his contract; and as the popular road of the present day is one in which broken stone forms a great part of the material, many will be interested in knowing that the most important part of the machinery, necessary for making such roads, can be had of the Blake Crusher Company, New Haven, Conn.

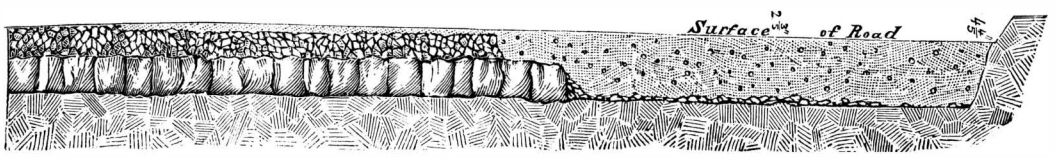

Fig. 3.—THE TELFORD ROAD.

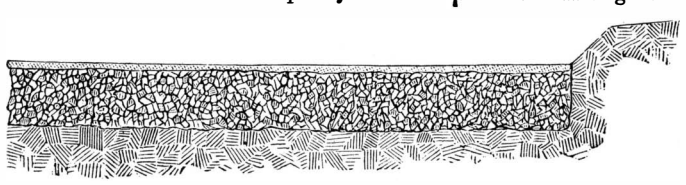

Fig. 4.—THE MACADAM ROAD.

Fig. 5.—ROAD WITH RUBBLE FOUNDATION.

The Decalcomanie Process.

The proper way to put on decalcomanie pictures, as ornaments for carriage panels, etc., is to varnish the pictures carefully with the prepared varnish purchased with them, with an ornamenting pencil, being sure to get the varnish on the white paper. In a few minutes the picture will be ready to place on the panel, and the paper can be removed by wetting it. When thoroughly dry, it should be varnished like an oil painting. Be particular to purchase none of these transfer pictures except those covered with gold leaf on the back, when they are to be applied to dark grounds.

Speaking of sunflowers, the *Maryland Farmer* says: For absorbing malaria, and preventing diseases caused by malarial influences, for prime food for fowls, for a home remedy, sure and safe, for founder in your horses, and for market as a profitable seed to be sold for making oils, be sure to sow sunflower seed.

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Correspondence.

Dividing Circles.

To the Editor of the Scientific American:

As there are very uncommon and odd numbers of teeth in some of the wheels of astronomical clocks, which cannot be cut by any common engine, it may be proper to show how to divide the circumference of a circle into any given odd or even number of equal parts, so that the number may be laid down upon the dividing plate of a cutting engine.

There is no odd number but from which, if a certain number be subtracted, there will remain an even number, easy to be subdivided. Thus, supposing the given number of equal divisions on the circle to be divided to be 69, subtract 9 and there will remain 60. Every circle contains 360°; therefore, as the given number of parts in the circle, which is 69, is to 360°, so are 9 parts to the corresponding arc of the circle that will contain them; which arc, by the rule of three, will be found to be 46·95°. Therefore, by the line of chords on a common scale, or rather on a sector, set off 46·95° with your compass, in the periphery of the circle, and divide that arc or portion of the circle into 9 equal parts, and the rest of the circle into 60; and the whole will be divided into 69 equal parts as required. Again, suppose it is required to divide the circumference of a circle into 83 equal parts; subtract 3 and 80 will remain. Then as 83 parts are to 360°, so, by the rule of proportion, are 3 parts to 13·01°; the small fraction may be neglected. Therefore, by the line of chords, with compasses, set off 13° in the periphery of the circle, and divide that portion or arc into 3 equal parts, and the rest of the circle into 80. Once more: Suppose it is required to divide a given circle into 365 equal parts; subtract 5 and 360 will remain. Then, as 365 are to 360°, so are 5 parts to 4 93°. Therefore set off 4·93° in the circle, divide that space into 5 equal parts and the rest of the circle into 360, and the whole will be divided into 365 equal parts, as was required.

I have often found this rule very useful in dividing circles into an odd number of equal parts, or wheels into odd numbers of equal sized teeth with equal spaces between them; and now I find it just as easy to divide any given circle into any odd number of equal parts as to divide into any even number. And, for this purpose, I prefer a line of chords on a sector to that on a plain scale; because the sector may be opened so as to make the radius of the line of chords upon it equal to the radius of the given circle, unless the radius of the circle extends the whole length of the sector, when it is opened so as to resemble a straight ruler, or scale, and this is what very seldom happens. Any person who is used to handle the compasses and the scale or sector may very easily, by a little practice, take off degrees and fractional parts of a degree by his eye, from a line of chords, nearly enough to the truth for the abovementioned purpose.

CAMBRIDGE.

The Legal Horse Power of Steam Boilers.

To the Editor of the Scientific American:

In your article on "Power of Steam Boilers," page 225 of your current volume, you seem to doubt the legality of my formula for horse power of steam boilers, and say that "it is certainly not legalized."

The unit of horse power was established by James Watt, and has since been legalized all over the civilized world, differing only slightly in different countries to accommodate different units of weight and measure; it is 33,000 minute foot pounds, which is the same as 550 second foot pounds. My formula is based upon this unit, and is therefore legalized; but being transformed into power of evaporation, you do not recognize it to be the same as Watt's rule.

The power of the same volume of steam measured in the ordinary way through a steam engine will give precisely the same result as that by my formula, which has been tested on different boilers and engines by different engineers. The legalization of Watt's rule makes my formula legal, and the same rule can be expressed by a great variety of formulas. The English custom of referring equivalent evaporation from and at 212° has caused much confusion and discordance in steam engineering; but on the continent of Europe, the evaporation is referred to the temperature 32° Fah., and my conviction is that the latter is the proper point of reference.

Philadelphia, Pa. JOHN W. NYSTROM.

[We are still of opinion that no legal status has yet been given to Mr. Nystrom's formula for translating foot pounds into evaporation of water.—EDS.]

The Wisconsin Steam Wagon Reward.

To the Editor of the Scientific American:

The Wisconsin $10,000 reward for a steam wagon is, I think, more likely to ruin many over sanguine inventors and mechanics than give them a fortune. To overcome all the obstacles mentioned is a mechanical impossibility.

I have had considerable experience with road wagons, and have tried and seen many very ingenious combinations, but they have all proved failures except as amusing toys. All builders of road wagons that I have seen say that they had no idea of the immense power it took to run them; and ob structions like loose sand or mud make them nearly helpless, to say nothing of steep hills, stones, etc. Another great drawback is the great weight of fuel and water necessary to carry. My carriage, the total weight of which was only 550 lbs., would use up 40 to 50 lbs. of water per mile. Therefore I think that a locomotive, complying with that Wisconsin law and running in ruts half way up to the hub, over stumps and stones and up steep sand hills, and averaging 5 miles per hour for 200 miles, trusting to luck in getting fuel and water, would have a sweet time of it. The idea is simply preposterous.

H. S. TAYLOR.

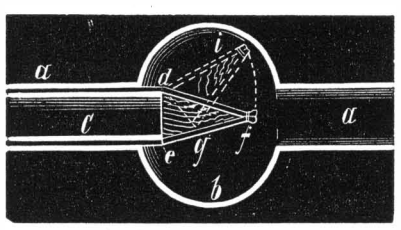
Derby Line, Vt.

Valve for Laboratory Use.

To the Editor of the Scientific American:

I herewith send you a drawing of a valve which is not, I believe, new, but is not well known, although it is very useful in the laboratory, and might be of service to some of your readers.

a is a glass tube with a bulb, *b*, blown in it; *c* is a short glass tube, smaller in diameter than *a*; *d* is a piece of rubber tube, a little longer than the tube, *c*, and of such a size as to fit tightly between the tubes, *a* and *c*; one end protrudes over the end of the tube, *c*, into the bulb, *b*. Into



this end of the rubber tube a small cone-shaped piece of wood, *g*, is slipped, with its base tight against the end of the tube, *c*; the end of the rubber tube is now drawn tightly over the piece of wood, *g*, and then tied at *f*. The rubber tube, *d*, is then cut almost off at *e*, the uncut portion serving as a hinge. The valve is shown open by the dotted lines at *i*. It will of course be understood that the rubber tube is to be drawn over the tube, *c*, the cone of wood put in the end, and the end tied and cut before it is put in the tube, *a*. When the foregoing operations are performed, the rubber tube, *d*, inclosing the tube, *c*, is run into *a*, until the end of *c* extends a short distance into the bulb, *b*.

Monticello, Pa. E. G. ACHESON.

New Rule for Calculating the Power of Steam Engines.

To the Editor of the Scientific American:

I have made a rule for calculating the horse power of steam engines, by which I get rid of nearly two thirds of the figures. It is as follows: Square the diameter of the cylinder, multiply by length of stroke in inches, multiply by the number of revolutions per minute, multiply by the pressure of steam, multiply by 4 as a permanent number, and cut off six figures to the right.

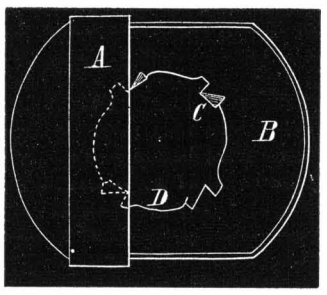
DANIEL SHINE.

Allentown, Pa.

Device for Protecting the Finished Parts of Screw-Cutting Dies.

To the Editor of the Scientific American:

The enclosed engraving represents a very simple and effective method of protecting the cutting parts of a die while the workman is finishing it after it has been tapped. A is a thin piece of soft steel, say one sixteenth inch thick, which is placed flat upon the die, B, so that the edge projects a very little beyond the points, C. When both are held firmly in the vise, the part, D, may be filed away without any danger of the file touching the points of the cutters.



I think the above might be classed among the useful wrinkles, and I send it, thinking it may be handy to some of your many readers.

J. P. LEWIS.

Haydenville, Conn.

Ammonia as a Cure for Rheumatism.

To the Editor of the Scientific American:

Permit me to inform your readers that caustic ammonia is no infallible cure for rheumatism. I read your paragraph on this subject on the day on which I was treated to the novel experience of acute rheumatism in my left leg. Several drops of ammonia were taken at once without effect, and similar doses a few days later. The complaint has steadily grown more aggravating since.

This rheumatic experience of mine also demolishes a popular fallacy, to which I admit I gave credence, that perfectly abstemious habits act as a prevention of such afflictions.

New York city. R. d'H.

The Proper Time to Fell Timber.

To the Editor of the Scientific American:

Some years since, I wrote an article for your paper in which I contended that after the tree was in full leaf was the proper time to fell timber. Since then I have seen an article stating that actual experiments made by the Prussian government had shown that the winter was the best time to fell timber. Thirty-one years ago, I was engaged in clearing up a large plantation, and building houses, stables, etc., with logs cut from the woods. I soon discovered that there was a difference in the lasting of different trees of the same kind. I also noticed that, in killing the trees to clear the land, some trees would decay much earlier than others; and that trees girdled in the early spring, just before the budding of the leaf, would rot off at the place where the tree was girdled; and that trees girdled in August would soon decay in the sap wood and bark, but that the heart would remain sound for years. The conclusion I came to was that the presence of sap in wood caused it to decay, and that the sap left the body of the tree during the time it was making leaves, new sap wood, and bark; and thus, at the fall of the leaf, the sap went into the heart or body of the tree.

If any one will cut a green tree after the fall of the leaf, and put one end in a hot fire, he will soon see sap ooze out of the whole stick, even in the middle; but cut a stick after full leaf, and the sap will run out near the bark. All timber that lasts well has but little sap at any time; all timber that decays easily has a great deal of sap, such, for instance, as the sugar maple, elder, and sycamore. All carpenters have seen large timbers that were perfectly rotten in the middle while the outside was apparently sound. This decay must have been caused by the presence of something besides heat and moisture. As the outside was sound while the inside was decayed, this must have been sap, and nothing else.

Oakley, Ark. J. H. MOORE.

Useful Recipes for the Shop, the Household, and the Farm.

Laboratory flasks which have contained oil or fatty matter may be easily cleansed by a solution of permanganate of potassa. To remove turpentine, petroleum, photogene, etc., wash with an ounce or so of sulphuric acid and rinse with water.

The comparative value of horse feed is found by experiment to be as follows: 100 lbs. of good hay is equal in value to 59 lbs. of oats, 57 lbs. of corn, 275 lbs. of carrots, 54 lbs. of rye or barley, and 105 lbs. of wheat bran.

A recent English patent, for the production of a glazed or vitrified surface on cast metal, sets forth the coating of molds with powdered glass, furnace cinder, or enamel, which is vitrified by the heat of the molten metal when the same is poured into the molds.

A new process for making tinned iron wire consists in first immersing it in a bath of muriatic acid in which a piece of zinc is suspended. After the acid has produced a new surface on the wire, it is placed in communication with a sheet of zinc in a bath of 2 parts acetic acid in 100 parts water, to which 3 parts chloride of tin and 3 parts soda are added. The wire is allowed to remain 2 hours in this mixture, after which it may be polished.

In the following will be found valuable details relative to the coloring of brass. An orange tint inclining to gold is produced by first polishing the brass and then plunging it for a few seconds in a warm neutral solution of crystallized acetate of copper. Dipping into a bath of copper, the resulting tint is a grayish green; while a beautiful violet is obtained by immersing the metal for an instant in a solution of chloride of antimony and rubbing it with a stick covered with cotton. During this operation the brass should be heated to a degree just tolerable to the touch. A *moiré* appearance, vastly superior to that usually seen, is produced by boiling the object in a solution of sulphate of copper. There are two methods of procuring a black lacquer on the surface of brass. The first, which is usually employed by instrument makers, consists in polishing the object with tripoli and washing it with a mixture composed of nitrate of tin 1 part, chloride of gold 2 parts. Allow this wash to remain for fifteen minutes, then wipe it off with a linen cloth. An excess of acid increases the intensity of the tint. In the second method, copper turnings are dissolved in nitric acid until the latter is saturated; the objects are immersed in the solution, cleaned, and subsequently heated moderately over a charcoal fire. This process must be repeated in order to produce a black color, as the first trial only gives a dark green. Finally, polish with olive oil. Much pains are taken to give objects "an English look." For this purpose, they are first heated to redness and then dipped in a weak solution of sulphuric acid. Afterward they are immersed in dilute nitric acid, thoroughly washed in water, and dried in sawdust. To effect a uniformity in the color, they are plunged in a bath consisting of 2 parts nitric acid and 1 part rain water, where they are suffered to remain for several minutes. Should the color not be free from spots and patches, the operations must be repeated until the desired effect is produced.

Paper may be prepared for bank cheques and other documents so that any writing in ink, once made thereon, cannot be altered, without leaving plainly visible marks, by passing the sheets through a solution composed of 0·015 grain gallic acid to 1 gill distilled water.

To silver cast iron, 15 grains of nitrate of silver are dissolved in 250 grains of water, and 30 grains cyanide of potassium are added; when the solution is complete, the liquid is poured into 700 grains of water wherein 15 grains of common salt have been previously dissolved. The cast iron intended to be silvered by this solution should, after having been well cleaned, be placed for a few minutes in a bath of nitric acid of 1·2 specific gravity just before being placed in the silvering fluid.

The base used in making artificial gems is strass, obtained by melting together 6 drachms carbonate of soda, 2 drachms burnt borax, 1 drachm saltpeter, 3 drachms minium, and 1½ oz. purest white sand. To imitate in color the following minerals, add to the strass the ingredients named in connection with each gem: Sapphire, 10 grains carbonate of cobalt; opal, 10 grains oxide of cobalt, 15 grains oxide of manganese, and from 20 to 30 grains protoxide of iron; amethyst, 4 to 5 grains carbonate of peroxide of manganese; gold topaz, 30 grains oxide of uranium; emerald, 20 grains protoxide of iron and 10 grains carbonate of copper.

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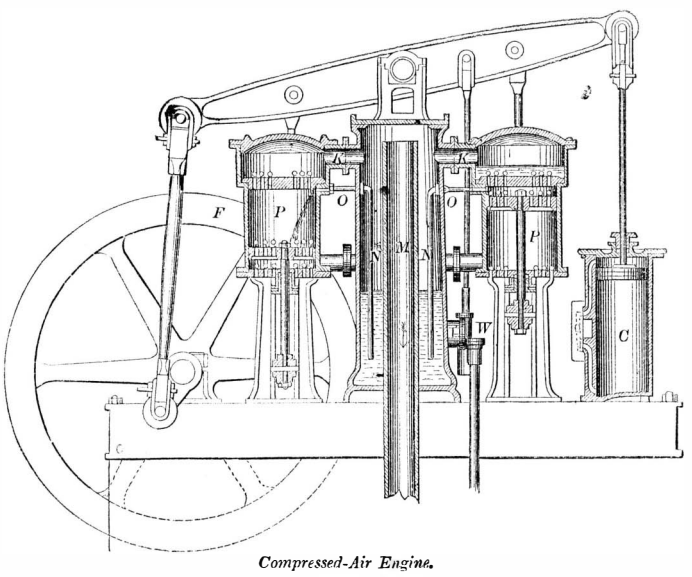
ENGINES AND LIGHTNING RODS.

Our extracts from Knight's "Mechanical Dictionary,"* for this week, include some illustrations and descriptions of interesting forms of engines, and of a large number of lightning rods. Fig. 1 is a

COMPRESSED AIR ENGINE

used in the lower shaft of a mine in Scotland. The steam cylinder, C, is 15 inches in diameter and has 3 feet stroke. It drives two condensing air pumps, P P, which work alternately, one on each side of the beam center, delivering the air into the center reservoir, N N, from which it passes into the main pipe, M. The beam is connected at the other end to a crank and fly wheel, F, for the purpose of equalizing the motion. The air pumps are inverted and are worked with crossheads sliding in vertical guides, by means of side rods, from the beam. They are fitted with ball valves, of which there are three sets to each pump, each set consisting of 44 balls, two inches in diameter. The balls are confined by separate cages to a lift of half an inch. A stratum of water, supplied by a pump, W, covers the piston valves and the delivery and inlet valves, through which all the air has to pass. The water flows from the central reservoir through the small pipes, O O, into each of the air pumps during the period of their downward stroke. Locomotives of the type shown in Fig. 2 are also driven by compressed air. In the reservoir, A, the air is compressed and is admitted to the chamber, B, where it is expanded to working pressure. The emission is regulated automatically by a plunger in a tube passing through the roof of the chamber, B. Above the plunger is a spring which yields to the normal pressure of the air in the chamber; but when, owing to the withdrawal of air to the working cylinder, the pressure in the chamber is relaxed, the spring depresses the plunger, and the connections of the latter turn a faucet valve in the pipe, C, and allow the passage of air from the reservoir, A, to the chamber, B, to restore the working pressure in the latter. The compressed air passes by the pipe, D, to the cylinder, E, where it acts in the manner usual with the double-acting steam engine, and exhausts into the atmosphere. F is the supply aperture through which the reservoir is charged, and G the safety valve. The piston rod, crosshead, and pitman connect in the usual way with the crank and driving shaft.

Fig. 1.



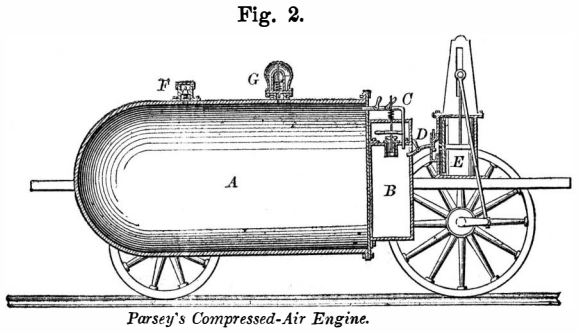
Compressed-Air Engine.

A curious form of rotary steam engine known as the

DISK ENGINE

was invented by Captain Ericsson, and improved by Bishopp and others. In the Ericsson engine, the disk revolves, and

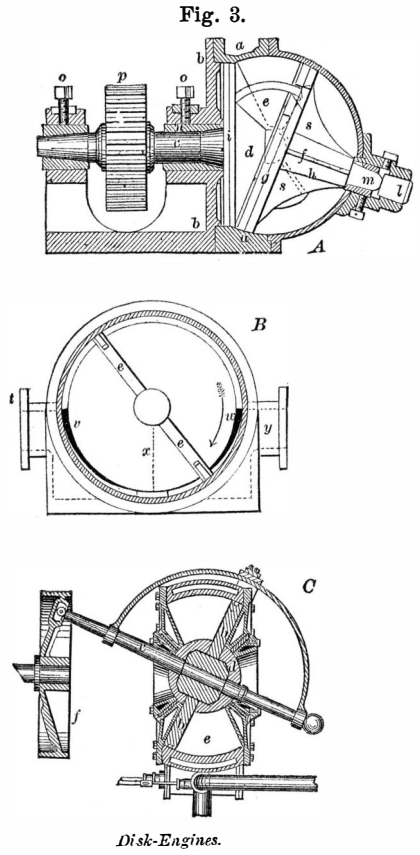
Fig. 2.



Parsey's Compressed-Air Engine.

in the Bishopp engine the disk oscillates. Ericsson's machine is shown at A B, in Fig. 3. Steam is admitted into a spherical chamber, *a*, by the neck, *t*, and opening, *v*, and being there prevented from passing the line, *x*, by the pressure of the disk against the cone at that place, it presses

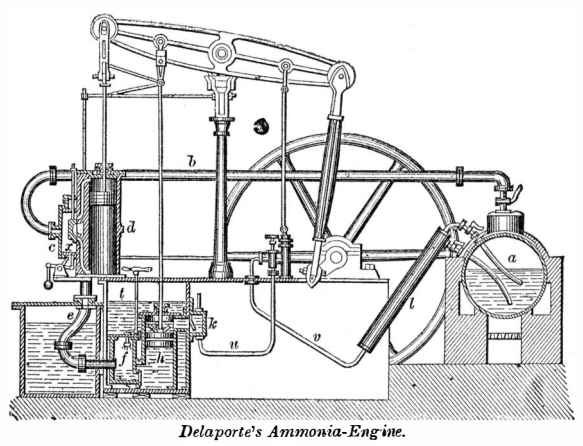
Fig. 3.



Disk-Engines.

against the upper leaf, *e*, which, together with the cone and disk, is thereby carried round in the direction of the arrow. When the leaf has passed the upper part of the opening, *w*, the steam that has been acting upon it escapes; but at the same time, the opposite leaf has passed the top of the steam opening, *v*, and is carried round in a similar manner. The engine has no valves, the action of the piston is at all times direct, and the machine can be stopped, started, or reversed at any position of the piston. In Bishopp's engine, shown at A, the disk and shaft do not reverse on their axis, though the ends of the shaft describe circles as the disk "wobbles" on the lines, keeping one radius on each side in constant contact with them respectively. An abutment is formed by a plate, *e*, which divides the annular space in which the steam works, the lower portion of the disk having a radial slit which enables it to slip back and forth on the abutment plate, *e*. The steam is admitted on one side of the abutment, and exhausted on the other, the live steam pushing the disk before it, by crowding between the disk and the conical head, and causing the outer end of the arm to communicate

Fig. 4.



Delaporte's Ammonia-Engine.

rotary motion to a wheel, *f*, to which it is connected by a universal joint.

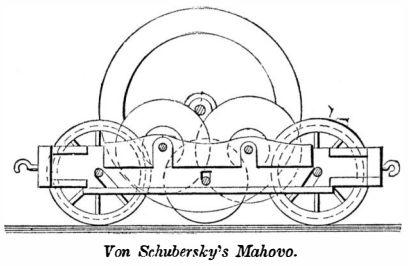
DELAPORTE'S AMMONIACAL GAS ENGINE,

shown in Fig. 4, is operated by ammonia vapor; *a* is the boiler; *d*, the cylinder; and *b*, the tube communicating between the cylinder and boiler; *c* is the valve box, and *x* the slider, by means of which the gas is introduced alternately above and below the piston; *e* is the eduction pipe, and *f*, the condenser and dissolver. The injection water is introduced by a pipe, at the top of the condenser, *f*. The solution passes from *f* to *h*, from which it is withdrawn by the piston, and passes through the reservoir, *k*, and the tubes, *u* and *v*, by which it is returned to the boiler, a small forcing pump aiding in this operation. The water, which has been deprived by heat of its ammonia, is withdrawn from the bottom of the boiler by the lower tube, and passes into the jacket, *l*, where it imparts a portion of its heat to a solution in the tube, *v*, which is on its way to the boiler.

THE MAHOVO

is the name given by its inventor, Captain Von Schubersky, of Russia, to an adaptation of a fly wheel to accumulate a reserve of force to be used at intervals when a greater power is needed. The device is shown in Fig. 5. A pair of heavy fly wheels are mounted on an independent truck, which, in railway trains, is attached in rear of the locomotive. In the

Fig. 5.



Von Schubersky's Mahovo.

intervals between the three pairs of running wheels are placed two pairs of friction wheels, resting immediately on them. In the angle between these rests the large axle of the mohovos, huge fly wheels which overhang the track. When the train moves, the running wheels impart motion to the friction wheels, and the latter transfer this movement to the fly wheels. As the train moves from rest, the velocity of the fly wheels is gradually accelerated until it attains a maximum corresponding to the maximum velocity of the train. If steam now be shut off, the fly wheels become a source of power, and will return a portion of the work stored up in them, so that they may be used to assist the engine in ascending grades.

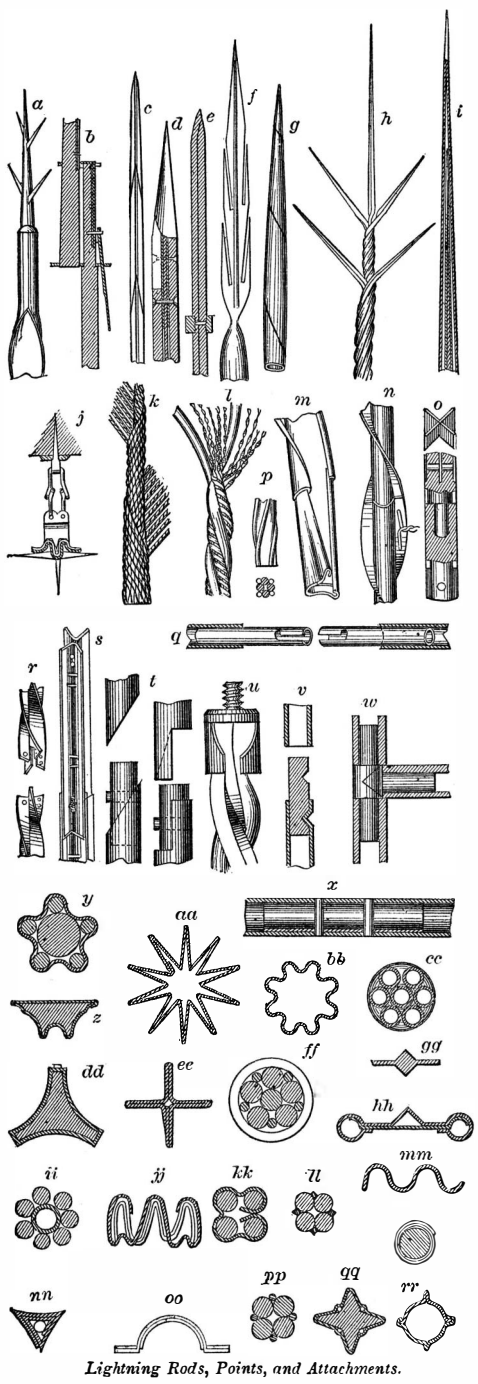
We add, in Fig. 6, a large number of shapes of

LIGHTNING RODS,

which may be described as follows:

a has a series of points formed of spiral coils, combined with a tubular portion, forming the tip. The conductor is a flat strip. *b* is a jointed tubular conductor for vessels. It is divided at the head of the lower mast, a branch leading down the shrouds on either side to the water. *c* is an iron rod tipped with copper, the point of which is gilded. *d* has a central copper slip inclosed between iron side pieces; the points of connection have interposed zinc plates. At *e* the iron rod is grooved to receive a copper slip. The joints are secured by screw-threaded washers. At *f* the point is formed with two opposite wings. The rod, *g*, is composed of a single strip of copper wound spirally so as to form a tube. *h* is composed of several strands of wire laid together so as to form a rope, and having several tips. The point, *i*, is formed of three or more metals inclosed one within the other, the most fusible outside. *j* is an insulating attachment with additional conductor points at the coupling of rod sections. *k* is a copper cable, composed of a central wire rope and two exterior strands laid up in opposite directions. *l* comprises two or more copper wire ropes intertwined with an equal number of iron rods. *m* is a series of metallic strips, forming a tube, are joined together. *n* is a metallic strip, doubled up or corrugated so as to form a tube with spiral flanges. At *o* the joints of the rod are coupled by pieces cross shaped in section and secured by rivets and bolts. *p* has four twisted rods with wire warming. At *q* the tubular sections are united by short pieces, slotted inside so as to form a species of bayonet joint, and held by pins. *r* is composed of two strips of sheet metal, riveted together at their angles and twisted spirally. The strips in *s* have slots through which staples fasten them. *t* is connected by short pieces fastened by pins, *u* is an exterior cable stiffened by a spirally flanged core, and the sections of *v* are secured by plugs fastened by indenting the tubes into suitable depressions. At *w* the sections are coupled by an interior cylinder and a tapering plug projecting from each of its ends. At *x* an interior tube with

Fig. 6.



Lightning Rods, Points, and Attachments.

pins holds the ends of the tubular sections together. *y* to *r r* inclusive represent sections of various kinds of patented rods.

* Published in numbers by Messrs. Hurd & Houghton, New York city.

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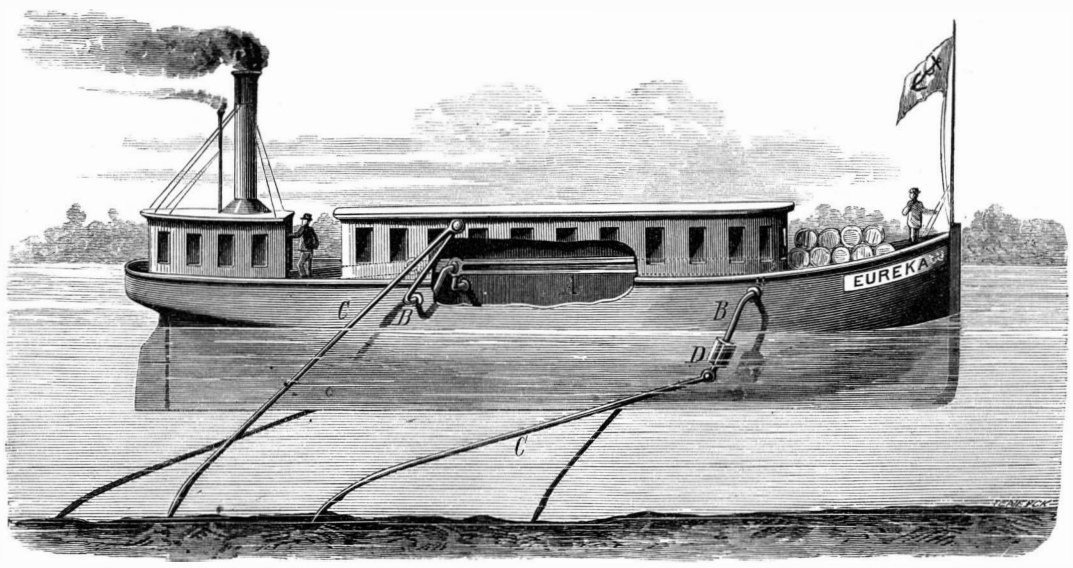
IMPROVED METHOD OF PROPELLING CANAL BOATS.

We illustrate herewith a new mode of propelling canal boats, which consists mainly in mechanism for actuating a series of push bars. The device is certainly simple, and, in the opinion of the inventor, when applied to boats, will prevent any loss of power by slip and any washing away of the banks of the canal. It may easily be arranged in the ordinary boats in use.

Placed thwartships the boat, and revolving in bearings attached to the framework of the same, are two shafts having cranks at their centers. These cranks are connected by a rod, A, so that the shafts may move together. To one end of the connecting bar the piston rod of a steam engine is attached. On the ends of the shafts are formed cranks, B, to the extremities of which are pivoted the push bars, C. The lower ends of the latter are formed to take hold of the ground on the bottom of the canal and push the boat forward. The cranks, B, are so arranged that one rod on each side of the boat may be working while the others are moving forward. The weights shown at D are intended to balance the cranks and give uniformity of motion to the shafts.

Patented through the Scientific American Patent Agency, February 15, 1876. For further particulars relative to purchase of patent, address the inventor, Mr. Louis F. A. Legouge, Wheatland, Yuba county, Cal.



LEGOUGE'S METHOD OF PROPELLING CANAL BOATS.

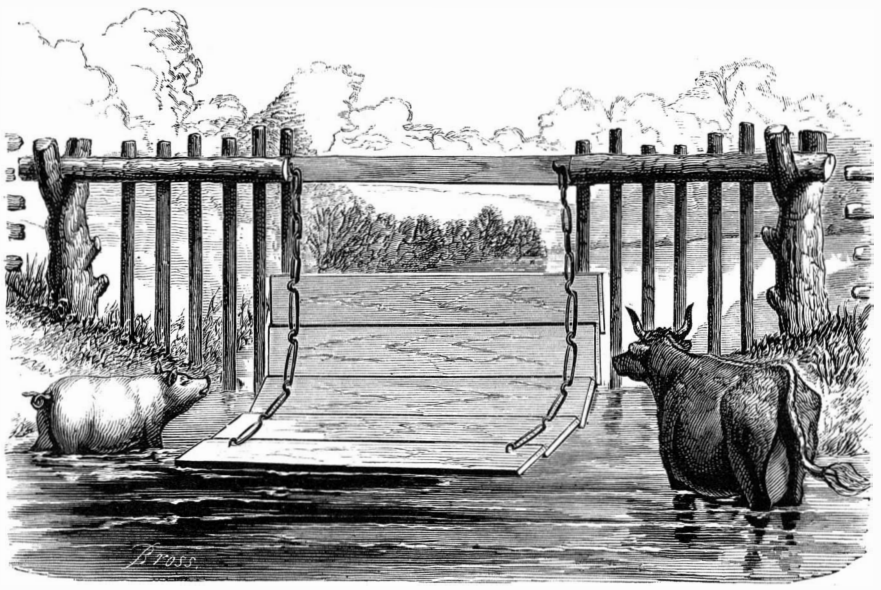
IMPROVED FLOOD GATE.

We illustrate herewith a novel and simple floodgate which any farmer can make from a couple of trace chains, a dozen stout staples, and a few boards. Its advantages are that it allows the water to flow past freely, and so not only obviates any danger of sediment or floating material blocking the channel, but favors the washing and deepening of the latter; it is entirely drift-proof and self-adjusting, and needs no skill to manufacture.

It consists simply of a series of boards united by the chain staples in such a way that the lower part of each may overlap the upper part of each lower board upon the up stream side. By this construction, as the water rises, the lowest board will float; and as the rising continues each board in consecutive order will be carried up. Any floating material will strike against the smooth surface of the gate and pass beneath it, so that there can be no obstruction of the water and no consequent damming and back flow.

The gate may extend entirely across the water course, or stakes may be driven at its ends, as shown. This last construction renders it less easy for stock to push the barrier open and pass down stream. The invention has been practically tested on a large farm with excellent results.

Patented through the Scientific American Patent Agency, March 7, 1876. For further particulars, relative to sale of county and State rights, address the inventor, Dr. R. H. C. Rhea, Uniontown, Union county, Kentucky.



RHEA'S FLOOD GATE.

Ill Advised Procrastination.

As matters now appear in the American section of the Centennial main building, there is going to be a repetition of the farce yearly enacted at the American Institute shows in this city. At the time of writing, beyond a floor neatly ornamented with chalked and lettered boundaries, and a few show cases, there are no signs of preparing the full exhibit promised from American exhibitors in the main structure. In Machinery Hall, more energy has been displayed, and progress is comparatively rapid; but elsewhere, it remains a disagreeable but none the less true fact that the French, English, and Spanish entries are much further advanced than those of our own country. It will be very unfortunate, not to say humiliating, if the opening day, now scarcely three weeks distant, shall find the American section a chaos of confused and badly arranged exhibits.

The Western Tanning Plant.

Messrs. Moffat Brothers, of Buffalo, N. Y., send us a letter from a Chicago firm in reference to the western tanning plant, described by us on page 181, current volume. The firm report that they made an experiment with the plant two years ago, and distributed it to other firms, the result in every case being that there was not tannin enough in the plant to preserve the green hides from decay; and making leather was altogether out of the question. If any one can throw light on the difficulty, we shall be glad to hear from him.

Danger from Street Telegraph Wires.

During the recent high winds in London, the following accident occurred in Farringdon street. Charles Holmes, a cabman, was driving a cab, and, when near the viaduct, one of the post office telegraph wires passing over the road snapped, and fell about the horse's head and body. The animal took fright, and bolted for some distance down the road, until it got entangled in the wire in such a manner that it was thrown completely over. It was with great difficulty that it could be extricated, and it was then found to be so severely injured that it would probably have to be killed. The driver had a narrow escape.

A similar accident occurred about the same time in St. Bride street. A telegraph wire broke, and a cab driver was caught round the neck by the broken wire, but fortunately he was not injured.

Another accident of the same kind in Islington was unhappily fatal. A Brompton omnibus, after finishing its journey at about five minutes past two o'clock, pulled up as usual at the York Hotel; and one of the horsekeepers, named William Stevens, was driving it to the stables, when a telegraph wire was blown away, and it fell round the poor fellow's neck, and nearly cut his head from his body.

Lightning.

The celebrated experiment of Benjamin Franklin, by which he demonstrated the identity of lightning and the common electric spark, was performed by him in June, 1752, at Philadelphia, Pa. Having made a small cross-stick kite, he covered it with a silk handkerchief instead of paper, so that it would stand rain, attached a tail, etc. The upper end of the cross had an iron point, connected by a string to the usual kite cord, which was of hemp. To the lower end of the cord an iron key was attached, and to that a short length of silk ribbon, as a non-conductor, by which the kite string could be safely held in the hand. On the approach of a thunderstorm he proceeded to a common near the city, and, with the assistance of his son, sent up the kite. Ere long the thunder cloud approached, the electricity came down the kite string, and Franklin, standing under a shed, received the electric sparks through his knuckles which he applied to the key, and charged his Leyden jar by putting its conductor in contact with the key. The rain then fell, which improved the conductivity of the kite cord, and the electricity appeared in increased quantity.

The news of this wonderful experiment rapidly spread over the world, and was extensively repeated. In France, Professor Romas made a kite seven feet high, with a fine wire interwoven in the string. The kite was raised five hundred and fifty feet, and is alleged to have yielded flashes of electric fire ten feet in length. In St. Petersburgh, Professor Richman, while attempting to repeat Franklin's experiment, received so heavy a charge of electricity that he fell dead. This was in 1793.

ONIONS given to horses in the first stage of the epizoötic are said to be very beneficial. They cause the animal to cough and sneeze and discharge freely from the mouth.

Brains and Brain Nutriment.

There was once a gentleman who used to argue that the soul is seated in the pineal gland; and that there are special regions of consciousness in the brain, different parts of which have different functions, is a doctrine now establishing itself on what may be considered sufficient authority. Further investigation in this direction may avail to show what should be the remedy for an atonic or hypertrophied ideal or other function. Meanwhile we have the assurance of Mr. Frank Buckland, who has lately passed a brilliant examination on the *ostrea edulis* before a House of Commons committee, that "brain power in those engaged in business and literary pursuits was greatly strengthened by phosphorus conveyed in the form of oysters." This assurance, although weighted with the statement that oyster meat costs $2.24 per pound, cannot fail to be of immense value to all those—not a large class—who have need of their brains. Candidates for the Indian Civil Service, Newdigate prize poem men, common jurymen, and the holders of foreign bonds will now, no doubt, eat, who never ate before; and city men, with whom, for their easy digestion, oysters are a favorite food, will eat the more. We cannot understand why "those engaged in business" should take precedence, in the repair of brain waste, of those engaged in literary pursuits, but can readily believe in the possibility of the proposal—a direct corollary to Mr. Buckland's assurance—that, as we have compulsory nurture of the mind, so we must have compulsory nurture of the brain. We wonder, says *Iron*, how much more luminous some of our most brilliant writers would have been had they but seen to a proper supply of phosphate of iron and osmazome.

The Railroads and the Centennial.

The various railroad companies whose lines lead to Philadelphia have met in convention and decided upon a reduction of twenty-five per cent in fares to the Centennial, and also that round trip tickets shall be issued for a period of sixty days. The Union Pacific is the only dissenting line, consequently the above reduction applies on all roads and east of Omaha. From St. Louis the Centennial fare will be $40.50, and from Chicago $33, for the round trips; and an additional dollar is charged if a route *vid* New York city be chosen.

For use on the Pennsylvania railroads between this city and Philadelphia, two kinds of tickets will be issued. One good for fifteen days will cost $5 for the round trip; the other is restricted to the day of issue, and is subdivided into three classes. The first class is good after 7 A. M., and costs $4; the second, between 6 A. M. and 7 A. M., costs $3; and the third, available for early birds, who prefer the cool of the morning for their journey, and hence start prior to 6 A. M., costs but $2. The first class tickets are good for express trains, which will run through from terminus to terminus in from two and a half to three hours, landing the visitor on the Centennial grounds. The second and third class trains will yield the right of way to those abovementioned, irrespective of relative hours of starting, and hence will occupy from four to five hours in the trip.

All trains, no matter whence they come, will run into the Centennial depot of the Pennsylvania road, which is located in Elm avenue, fronting Machinery Hall.

A New Plant for the Dooryard.

Among the plants distributed this year from the botanic garden in Washington, says the *Star*, is the *aralia papyrifera*. This plant produces the beautiful substance known as rice paper; it has soft, downy, palmate leaves; it grows ten feet high, with a stem four inches in diameter, full of white pith like the elder; in a full grown specimen the pith is about one inch in diameter. It is divided into pieces three inches long, and by the aid of a sharp instrument is unrolled, forming the thin narrow sheets known as rice paper, greatly used by the Chinese for drawing figures of plants and animals, and also for making artificial flowers. Until about 1850, the source of this substance was unknown to scientists. The Chinese, on inquiry, gave very fanciful figures and descriptions of it, illustrating the fact that then, as now, "for ways that are dark, and for tricks that are vain, the heathen Chinee is peculiar." It was first introduced from the island of Formosa to Europe, at Kent gardens, in 1853; from there it has been widely disseminated. It is almost naturalized in some parts of Australia; in the Southern States, and perhaps California, it will flourish. As an outdoor ornamental foliage plant, it is well worthy of cultivation in any part of the country.

J. C. S., Jr., says: I take seven papers, but would rather part with all others than with the SCIENTIFIC AMERICAN.

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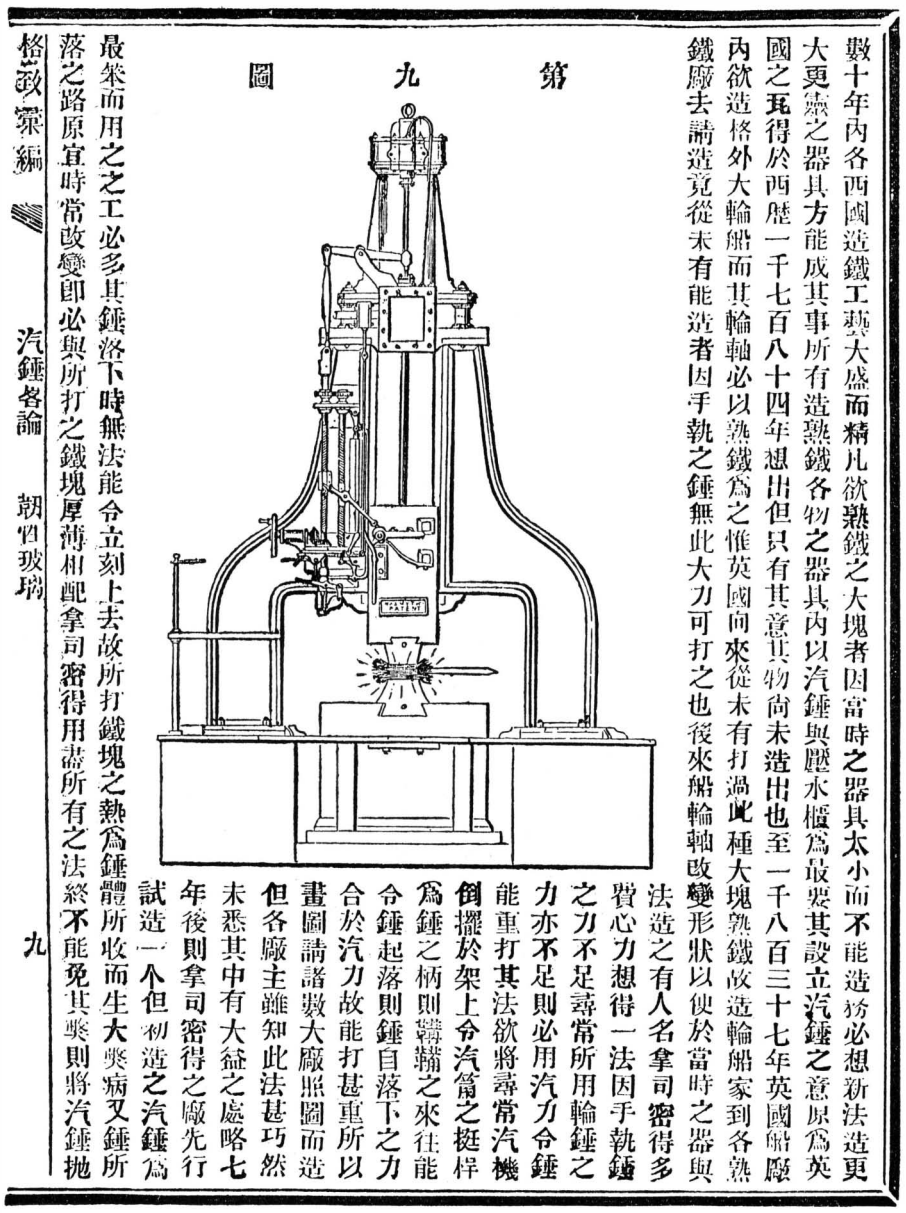
A CHINESE SCIENTIFIC JOURNAL.

There lies before us a very curious periodical. It is a pamphlet of about thirty pages, stitched with green silk in covers of the brightest yellow. On the back, or rather the front, for the book is read backwards, there is a strip of bright pink paper, covered with hieroglyphics. The pages are each double, that is to say, instead of the print appearing on each side of the sheet, it is impressed on one side, the sheet is folded, and the free ends bound inwards, so that the edge of every leaf is a fold. The paper is of that soft India variety used here for engravers' first proofs. Finally, the characters are all Chinese and printed in vertical lines. Such is the appearance of the first Chinese scientific journal, the *Chinese Scientific Magazine*, a page of which the reader has before him in the annexed engraving, reproduced in facsimile

The editor, Mr. John Fryer, of Shanghai, writes us that it is his "ambition to make this magazine to China what the SCIENTIFIC AMERICAN is to every country where the English language is known. My aim is high, but perseverance will enable me to succeed, even if only in a small degree;" and he tells us in his prospectus that the journal is to "serve as an introduction to the translation of scientific books already existing in Chinese; it will contain notes or lectures on scientific subjects," and in brief is intended to disseminate useful scientific and practical information throughout the country. It is published monthly at 50 cents per year and will be illustrated copiously; a specimen of the pictorial embellishments is here shown. We admit our inability to read the letter press, and hence are in the dark as to the table of contents of the present number; but there seems to be an interesting variety of articles (if we may judge from the engravings) relating to the solar system, the seasons, eclipses, etc., a circular saw, a steam hammer, and various other mechanical apparatus.



It may justly be considered that the establishment of this journal—and we trust it may meet with unbounded success—marks another breach in that wall of exclusiveness with which for centuries China has encompassed herself. That country is beginning an era fraught with the deepest significance to all western nations, an era when a great people, capable of high development, undertake to arouse themselves from a lethargy of ages, and, by acquiring the knowledge which the world has learned during their long sleep, to place themselves on a level with the vastly younger nations which have far outstripped them in civilization and progress. In the past the Chinese have been great engineers (as witness the colossal canals, cities, bridges, and temples still existent) and greater inventors, for, very many years before such things were thought of in Europe, they invented the compass, gunpowder, paper, porcelain, and printing. No people have approached them in agriculture, none have so wide a knowledge of the use and value of artificial fertilizers; for centuries past, no matter for the enrichment of the land has escaped their utilization. Moreover they are cunning, even wonderful, wo kmen, scarcely to be approached in the marvellous delicacy of their productions or for the patience with which they attack herculean tasks. In no country is education so highly prized, and among no other people does political preferment depend, as it does in China, almost wholly upon scholastic acquirements. Now all that seems wanting is the extension of that education, beyond the lore of Confucius and ancient tradition, to the world's modern progress; and the barriers to this, so long maintained, China herself is now tearing away. The very vastness of her population is the most serious obstacle to her advancement, even from the single view that the consequent cheapness of manual labor will militate against the introduction of machines for its replacement; but that this in time will be overcome, perhaps through the immense industries which it is possible to establish, or through the development of the great unworked mineral resources of the country, there is no reason to doubt. Chinese students are now all over the world studying the habits and customs of the most advanced people, in order to return and instruct their own ccuntrymen; the first railroad has recently been introduced into the country; and China is organizing a navy of modern ironclad vessels. The signs of progress are everywhere. It is scarcely within the reach of prophecy to predict that the next, if not the present, generation will feel the industrial competition of China, not alone through her emigrants here or elsewhere, but through her own people working within her own borders.

Education in China.

Wong Chin Foo, the Chinese lecturer, was present at the Teachers' Institute of Adams county, Pa., not long ago, and delivered an interesting address on the subject of education in China. He said that the first lessons inculcated in Chinese schools are obedience and reverence for parents and respect for teachers. He claimed that in no country in the world is education so general as in China, and that in no other country are intelligence and moral worth so promptly and so liberally rewarded by the government. He also alluded to the Great Wall of China, the immense number and size of its walled cities, its palaces and works of art, its canals, and other public improvements, its wars and its civilization, its geography and history, and its systems of religion. He closed with a demonstration of the Chinese method of computation, which was truly wonderful for rapidity and accuracy. By means of an ordinary abacus he performed the most difficult operations in addition and subtraction with the utmost dispatch and correctness, throwing the so called lightning calculators completely in the shade. The lecturer also described the manner and customs of his people, using good English and speaking with but a slight accent. We quote his language, as reported in *Home and School*; "The capitals of the different divisions of the empire are all walled cities. There are seventy-five thousand of these walled cities in China. The material in these walls is sufficient, in the aggregate, to construct a wall thirty feet high and twenty feet thick entirely round the world, and leave brick and stone enough to build all the houses in the United States besides. This may seem wonderful, but it is true. In China everything is done in a different way from what it is done in this country. The manners and customs of the people are different. In this country when a gentleman enters a parlor or drawing room, or goes into society, he is expected to remove his hat; in ours, he is expected to keep it on. In China it is considered very rude and uncivil to go into company with the head uncovered. In your country, when friends and acquaintances meet, they seize and shake each other by the hand; with us, when friends meet, each clasps his own hands and shakes them to his satisfaction, at the same time giving expression to his feelings in a suitable manner. You read and write from left to right; we from right to left. This is altogether a habit and education, and one method is just as good as another, provided one understands it. With you, black is the prevailing color of mourning; with us, white serves the same purpose. Your young people, previous to marriage, usually spend much time cultivating each other, and trying to ascertain their mutual adaptability and congeniality; we leave the matter in the hands of our parents, who manage our matrimonial affairs in a way at once satisfactory to themselves and to us. And I am free to say you will find as much conjugal happiness among a given number of families in China as you will find in any other country of the world."

Wear of Railroad Rails.

We recently called attention to the reported fact that, on a railway running north and south, the eastern rail wears out the faster. This has been attributed to the earth's rotation. We recommended that the eastern rails and wheels should, therefore, be made stronger than the western. The Chicago *Standard* accuses us of making an error, as "the wheels running on the eastern rail going south run on the western rail going north." A journal that can print such an absurdity as this only exposes its ignorance of common things.

The Origin of Our Earth.

The following curious experiments, recently made by a German observer, M. Sacher, may perhaps be regarded as throwing some light on the mode of origin of our earth.

By mixture of water and alcohol prepare a series of spirit solutions of the following densities: 0·9, 0·82, 0·88, 0·87, 0·865, 0·86, 0·85, 0·83. Into a glass cylinder, or a high, broad beaker glass, pour first some distilled water, then spirit solutions of 0·9, 0·89, 0·88. By careful pouring, the cylinder being held inclined, you may obtain the liquids stratified over one another without mixing. Heat the remaining less dense spirit solutions simultaneously, in beakers over five spirit lamps, up to near the boiling point (to about 167°), and then pour them carefully, in the order of their density, on the cold spirit solution. Over a sixth spirit lamp heat 3 to 5 ozs. of spermaceti in a beaker to 194° or 212°; dip a pipette into the fused mass, allowing about 0·25 cubic inch to enter. Then cover the opening with your thumb, and put the pipette so far down in hot alcohol that equilibrium occurs. By slowly drawing out the pipette, with thumb removed, you can, after a little practice, cause the fused mass of spermaceti to form one or several balls, floating in the liquid. The density of the fused spermaceti quickly diminishes with increasing temperature. The ball, therefore, does not, in each experiment, remain floating in the same spirit layer. By quick introduction you obtain it in the density 0·85; then, in cooling, it sinks slowly to the density 0·87.

These fused and slowly sinking balls now afford an opportunity of observing the solidifying of a body simply left to its cohesion. The following phenomena may be noticed:

1. The balls which, through currents in the alcohol, come very near each other, unite. The most frequent unions occur in the moment of solidifying.

2. When a ball comes into a spirit layer, the temperature of which is under 112°Fah. (the melting point of spermaceti), solidification occurs at the surface. If this solidification begins first at one side or above, the balls begins to rotate.

3. Frequently one observes the sudden ejection of a small mass from a ball.

4. The rind consists at first of a smooth, thin skin. With increasing thickness, however, this becomes uneven.

5. The unevenness still increases, even after the rind has formed a complete spherical shell round the inner fused mass.

6. In the majority of balls, when the cooling does not proceed too slowly, there occurs a very remarkable phenomenon. As soon as the rind has acquired such firmness that a wrinkling of it is no longer possible, it sinks in at the thinnest part, and an opening is formed, through which alcohol penetrates into the interior.

7. The balls now sink pretty quickly into the denser and cold spirit solutions, and one may soon take them out and examine them with a microscope. After some time, however, there is a further interesting change in them.

8. The surface of the ball, after a few days, is found to have become crystalline. While the elevated parts, after extraction, are mostly smooth and transparent, they become later untransparent, white, and rough. If you examine this surface with a microscope of 60 magnifying power, you find in it a striking similarity to a bare mountain landscape.

8. By rotation of the fused balls, one may flatten them, and allow them to solidify during rotation.

Calla Lilies.

Mrs. Rollin Smith, of Swanton, Vt., writes to the Burlington *Free Press* as follows: "Since your recent notice of my possessing a continually blooming calla, I have received several letters from different parts of the State asking me for the treatment which produces such favorable results. I use a four gallon jar, and give an eastern exposure. In the summer, I keep it wet enough so the water may stand on the top, and at all times very wet. Once a year I take the plant, shake the earth from the roots, and fill the jar with earth taken from under old sod. As soon as a blossom commences to wither, I cut it down, never allowing a flower to die on the plant. The result is that in sixteen months I have had eighteen blossoms on the same plant, and at the present time it has two very large full blossoms."

Suet Butter.

The Waverly Butter Company, of Charlestown, Mass., call attention to their continued operation of their patent for the manufacture of butter from suet and cream, and deprecate the statements, now so common, that the artificial butter processes have all proved failures. They are doing a large business, with perfect satisfaction to their customers.

ALL interior fences should be portable and easily removed from place to place, and removed entirely and stored away when not wanted. Every farmer has long lines of fences which, for half the time, are of no use whatever.

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DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

TRADEMARK CONTRACT.—ANDREW COE *vs.* WILLIAM L. BRADLEY.

[In equity.—Before Shepley, J.—Decided October term, A. D. 1875: To wit, February 17, 1876.]

Shepley, J.:

This bill is filed upon a written contract between the parties, dated February 13, 1862. By this contract Coe assigns to Bradley the exclusive use for seven years of his trademark, "Coe's Superphosphate of Lime," reserving a limited right previously granted to the firm of Coe & Co. Coe covenants that he is the exclusive owner of said trademark, with the exception above named. He constitutes Bradley his attorney, irrevocably, with authority to prosecute any suits necessary to make his rights available, and protect himself in their full enjoyment.

These are the only express covenants and agreements on the part of Coe. Bradley covenants to energetically prosecute the business of manufacturing and selling the superphosphate, and continue to make it of as good quality as that before made by Coe; and so long as the agreements above mentioned shall be kept by Coe, Bradley shall have use of the trademark, to pay him him one third of the net profits of the business, and of other "bone business," first reserving out of the profits of the business, as his own compensation, three thousand dollars.

This clause is also to be found at the close of the contract: "Any breach of the agreements above cited by either party or his representatives shall be a release to the other party and his representatives from all obligations by him or them to be performed but for such breach."

By a supplementary contract of May 2, 1862, between Coe and Bradley, and Russell and Coe, and Elmore Coe, the plaintiff's share of profits is reduced from one third to one sixth part.

During the existence of this contract Coe (in violation of his agreement, as implied from his conveyance of the exclusive right of the trademark to Bradley), at Chelsea and other places, manufactured and put on the market a fertilizer of an inferior quality, sometimes under the trademark of "Coe's Superphosphate of Lime," and sometimes "Andrew Coe's Superphosphate of Lime," which last name so nearly resembled the original trademark that it was calculated to deceive, and did deceive, purchasers, and therefore the use of it was as much a violation of his implied agreement with Bradley as the unauthorized use of the words "Coe's Superphosphate of Lime." A court of equity will examine to see if the differences are merely colorable. (Dixon Crucible Co. *vs.* Guggenheim American Trade Mark case, 559; Kent Com. 12th Ed., *366, cases in note. Meriden Britannia Co. *vs.* Parker, 39 Conn., 450.)

It is claimed on the part of the defendants that such unauthorized use of the trademark by Coe himself, in violation of the letter and spirit of the contract, was such a breach of the contract as exonerated the defendants from any liability to account and pay over to the complainant one sixth part of the profits of the manufacture under the contract. In support of this position reliance is placed on the clause in the contract that "any breach of the agreements above cited by either party or his representatives shall be a release to the other party and his representatives from all obligations by him or them to be performed but for said breach." The effect of this clause in the contract is only to enlarge the right of rescission, and enable one party to discharge himself from the contract, and terminate his obligations under it, at his election, in case of the failure of the other party to perform some portion of the contract not otherwise regarded as an essential part of one entire act. (Wallace *vs.* Shovel Co., 44 N. H. 521.)

But, although Bradley well knew that Coe was manufacturing and selling under the trademark in violation of his implied agreements under the contract, and of an express agreement under a later and supplementary contract, he did not elect to terminate his obligations and abandon his rights under the contract by rescission, but continued to manufacture in great quantities, and to put the manufactured article upon the market under the trademark. No construction can be given to this clause which would enable one party to the contract to enjoy the fruits of it without compensation, upon the ground that the other party had failed to perform some stipulation on his part which was not so essential to the contract, but that the breach of it could well be compensated by damages.

The claim of the defendant that the covenants broken by the complainants were of such a nature that no recovery can be had by him of the defendant cannot be sustained. The consideration of the promises of Bradley was the conveyance by Coe of the exclusive right to the trademark, and there is no question but that the conveyance was operative to vest in Bradley the exclusive right to it for the term of seven years, subject only to the exception in the contract itself. The express covenant of Coe was only of exclusive ownership in himself, and that no persons besides the excepted party specified had been authorized to use it. There has been no breach of this express covenant. The implied covenant that he would not himself be a trespasser or infringer on the right and title he had vested in Bradley is the one which he violated, and Bradley had a right to elect to retain the title and claim damages against Coe for infringement of his right, or to rescind the contract under the final clause enlarging his right of rescission.

Where a covenant goes only to a part of the consideration on both sides, and a breach of it may be paid for it in damages, it is an independent covenant, and an action can be maintained for a breach of the covenant on the part of the defendant without averring performance in the declaration.

Where the plaintiff's covenants which form the consideration be dependent, yet if part of the consideration be accepted and enjoyed by the defendant, and the plaintiff have no other remedy than on the covenant, and the breach on the part of the plaintiff can be compensated in damages, the plaintiff may recover without alleging performances of the residue. (Stevens *vs.* Curling, 3 Bing., N. C. 355; Cutter *vs.* Powell, 2 Smith, L. C., cases in note; Pordage *vs.* Cole, 1 Saund., 320, and Williams' Note, 4; Campbell *vs.* Jones, 6, T. R. 573; Carpenter *vs.* Cresswell, 4 Bing, 409; Foster *vs.* Purdy, 5 Met., 442-444; Wallace *vs.* Shovel Company, 44 N. H., 521.) These are the well settled rules applicable to proceedings in courts of law.

Courts of equity are still more liberal in their interpretation of contracts, allowing a specific performance of a contract sometimes to be enforced at the suit of a party who has not punctually performed the contract on his own part, but has been in default, where the default on his part is such as admits of compensation. In Hayward *vs.* Angell (1 Vern. R., 223), the Lord Keeper said "in all cases where the matter lies in compensation, be the condition precedent or subsequent, he thought there ought to be relief."

The defendant relies upon certain other contracts set up in his answer between himself and the complainant. Two of these are prior in date to the contract of February 13, 1862, and it is not perceived how that contract is affected by them. The subsequent contracts recognize the right to the trademark which Bradley has under the contract of February 13, 1862, but do not confer upon him such a right independent of that contract. The contract of August 1, 1862, recognizes the existence and validity of the previous contracts.

The case should be referred to a master to report the amount to which the complainant is entitled for his one sixth part of the net profits under the contract, and also to report what sum is to be allowed the complainant in reduction, by way of compensation in damages for the infringement of the defendant's exclusive right to the trademark by the complainant by his use during the term of the trademark "Coe's Superphosphate of Lime," or of the trademark "Andrew Coe's Superphosphate of Lime."

Decree for reference to master in accordance with the opinion to be prepared and submitted to the court.

[*George S. Boutwell*, for complainant.
H. G. Parker, for defendant.]

NEW BOOKS AND PUBLICATIONS.

WATER WHEELS, OR HYDRAULIC MOTORS. By M. Bresse, Professor of Mechanical Science at the School of Bridges and Highways, Paris, France. Translated by F. A. Mahan, U. S. A. Price $2.50. New York city: John Wiley and Son, 15 Astor place.

The author of this book is one of the most eminent of contemporary civil engineers; and his work is the standard authority in Europe on its subject. The value of such a treatise to our professional men cannot be over-rated, as there is no country in the world which is so liberally endowed with water power as ours, nor one in which that grand gift of Nature is so thoroughly and ingeniously utilized. Professor Bresse treats the whole subject in an exhaustive and authoritative manner, and he places before his readers some methods of utilizing water power which are not generally known in this country. The analysis of the turbine is excellently shown in this work, and t chapters on pumps form a treatise which will be of value to the many engaged in manufacturing the thousands of these machines sent out every month. Lieutenant Mahan has executed his task with care and fidelity, and has rendered the book more valuable to the general reader by translating the French measures with English.

MODERN AMERICAN HOMESTEADS. Illustrated by Forty-Six Plates. By Daniel T. Atwood, Architect, Author of "Designs for Country Homes," etc. New York city: A. J. Bicknell & Co., 27 Warren street.

Among the many books on this subject which have reached us lately, there has been none to compare, in excellence and variety of designs, with this volume. The illustrations include cottages and homesteads, dairies and ice houses, stables and outbuildings, as well as residences in all parts of the country, varied to suit different climatic conditions. Full descriptions, specifications, and statements of probable cost accompany the designs. This work will be especially useful just now, as many persons commence building at this season of the year; and to such we cordially recommend the book as a practical authority.

THE TEXTILE COLORIST, a Monthly Journal of Bleaching, Printing, Dyeing, and Finishing Textile Fabrics, and the Manufacture and Application of Coloring Matters. Edited by Charles O'Neill, F.C.S., Author of "Chemistry of Calico Printing, Bleaching, Dyeing," etc. Nos. 2 and 3. Subscription Price, $12 a year. New York city: John Wiley & Son, 15 Astor Place.

As our printed cotton manufacturers are now opening a large trade abroad, the efficiency of the dyeing processes and the permanency of the tints are matters of especial importance, as their products are to be placed in competition with the renowned fast colors of England and the simple and correct taste with which the French manufacturers ornament their textile fabrics. The publication now before us is likely to be of eminent use in aiding our manufacturers to improve their wares. It is edited by an undoubted authority, and filled with contributions by the best practical men of the day; and the illustrations consist of pieces of stuff, dyed and finished, affixed to the pages. Although a thoroughly technical journal, it is full of interest, the article on dyeing wool and silk at the celebrated Gobelins factory, near Paris, France, being especially commendable.

THE AMERICAN SOCIALIST, devoted to the Enlargement and Perfection of Home. Published Weekly. Subscription Price, $2 a year. Oneida, N. Y.: The Oneida Community.

The peculiar views of domestic morality which have made the Oneida community notorious are advocated in this publication with as much temerity as in the *Oneida Circular;* and they are not likely to find much favor with the world at large, whose wholesome prejudice in favor of conjugal fidelity is the safeguard of society, and who view with especial disfavor any any attempt to elevate promiscuous intercourse into a religion.

THE ENGINEERS' AND CONTRACTORS' ILLUSTRATED BOOK OF PRICES of Machines, Tools, Ironwork, and Contractors' Material, for 1876. New York city: E. and F. N. Spon, 446 Broome street.

This book is one of the best trade manuals we have seen for some time. It consists of complete priced catalogues of the manufactures of nearly 100 large firms, printed uniformly and illustrated. Machinists, architects, and builders will find it especially useful, as in it may be found descriptions and engravings of nearly every kind of work in metal, with the price at which each article is now put on the market. It is very creditably got up, and is a handsome volume.

THE STATIONER'S HANDBOOK, a Practical Business Guide for the Use of Retail Stationers and Booksellers. Edited by H. D. Monachesi and A. B. Yohn. Price $1.50. New York city: Office of the Publisher's Weekly, 37 Park Row.

This volume contains a large amount of practical trade information, embodied in interesting treatises on various branches of the trade. These are supplemented by full and comprehensive price lists of the leading stationers.

THE AMERICAN MECHANIC, an Illustrated Journal devoted to the Interests of Inventors, Manufacturers, and Consumers. Vol I., No. 1. Published Monthly. Subscription Price, $1 a year. New York city: Munson & Wilkinson, 239 Broadway.

Another new industrial paper. We hope our young contemporaries are not crowding each other uncomfortably.

PRACTICAL INSTRUCTION IN THE ART OF WOOD ENGRAVING. By Charles W. A. Emerson. Price 50 cents. East Douglas, Mass.: J. Batcheller.

A handy little treatise on a beautiful and useful art.

PSYCHE, the Organ of the Cambridge Entomological Club. Published Monthly. Price, $1 a year. Cambridge, Mass.: Published by the Editor.

THE METER-DIAGRAM.—This is a neat chart, published by Messrs. A. & T. W. Stanley, of New Britain, Conn., the main object of which is to familiarize the student with the metric system of measurement. A yard measure, subdivided into feet, inches, and fractions, is printed beside a meter measure, also divided, but into decimal portions. This gives at once, by mere inspection, an idea of the relations of the two systems. Besides, the chart includes various tables and explanatory notes. Publications of this kind are both useful and needed, since it is eminently desirable that the public should become familiarized with the metric system. A treaty between this country and the majority of all the nations in the world is now pending, whereby the meter is made a standard of international measure, so that it is reasonably certain that, before very many years, our present clumsy system of feet and inches will have given place to that in which, as in our currency, the fractions are decimal parts of the whole.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From February 4 to March 28, 1876, inclusive.

BREECH-LOADING CANNON.—J. R. N. Owen, Hamilton, Nev.
BRICK MACHINE, ETC.—E. R. Gard, New York city.
CAR.—J. H. Small (of Buffalo, N. Y.), Glasgow, Scotland.
CAR MOTOR.—A. P. Thayer, New York city.
CARTRIDGE, ETC.—H. C. Bull, Brooklyn, N. Y.
CENTRIFUGAL PUMP.—W. P. Andrews, Brookhaven, N. Y.
COMPASS.—S. Bent, St. Louis, Mo.
DIAMOND-CUTTING MACHINE.—H. D. Stover, New York city.
DYEING FABRICS, ETC.—J. Harley, Lowell, Mass.
FEEDING FURNACES.—W. C. Ford, Brooklyn, N. Y.
FIRE ALARM, ETC.—W. B. Watkins, Jersey City, N. J.
FOLDING MACHINE.—S. D. Tucker, New York city.
GLOVE FASTENING.—C. R. Ferguson, Washington, D. C.
HEAVING THE LEAD.—C. E. Kirtland, Milwaukee, Wis.
HORSESHOE MACHINERY.—W. M. Greenwood *et al.*, Cincinnati, Ohio.
JOINING KNIT GOODS.—J. Bigelow, Boston, Mass.
LAMP FILLER, ETC.—J. F. Collins, New York city.
LANTERN.—J. M. Dietz, New York city.
LIGHTING WITH OIL.—C. Godfrey, Huntington, N. Y.
LOOM PICK.—H. McManus (of New York city), London, England.
LUBRICATOR.—N. Seibert, San Francisco, Cal.
MOWER AND REAPER.—W. A. Wood, Hoosick Falls, N. Y.
NEEDLE MACHINE.—Cook and Porter Company, Boston, Mass.
ORE SEPARATOR.—G. S. Redfield *et al.*, Chicago, Ill.
PRINTING METAL.—L. B. Smith, New York city.
PROJECTILE.—H. M. Quackenbush, Herkimer, N. Y.
PROJECTILE.—R. P. Parrott, Cold Spring, N. Y.
ROTARY ENGINE.—T. E. Stewart, Boston, Mass.
SHIP'S TABLE.—E. P. S. Andrews, Boston, Mass.
SLIDE VALVE INDICATOR.—J. S. Wallace, Brettland, Ohio.
SOLAR CHRONOMETER.—M. Wheeler, Big Rapids, Mich.
SPINNING MACHINERY.—J. Hunter *et al.*, Adams, Mass.
STEAM VALVE.—E. Cope *et al.*, Hamilton, Ohio.
STEAM WHISTLE.—C. McKiernan, Paterson, N. J.
STRAW-SEWING MACHINE.—M. P. Carpenter, New York city.
TREADLE.—C. Brandtner, Reading, Pa.
VARNISHING AND LINING MACHINE.—G. L. Jaeger, New York city.
VENEERING, ETC.—C. W. Spurr *et al.*, Mass.
VENTILATOR.—W. H. St. John, New York city, *et a*.
WHEEL SKATE.—S. O. Brown (of San Francisco, Cal.), London, England.
WIRE-BENDING MACHINE.—H. W. Putnam, Bennington, Vt.

Recent American and Foreign Patents.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED BELT FASTENING.

Thomas D. Brady, Baldwin, Pa.—In using the coupling, a certain number of holes are formed in the ends of the belt, which ends are then passed through the cavity of a frame. The holes are then passed over pins on a wedge-shaped bar, which is dropped into place in the cavity of the said frame. As the belt is run upon the belt wheel, this bar will be drawn down to its seat, securely clamping the ends of the belt between its sides and the sides of the frame. The object in view, in addition to providing a strong and secure fastening, is to leave a surplus of perfect belting at each coupling, to provide for the shortening up by breaks, and to leave no necessity for piecing at said breaks.

IMPROVED LAMP FUNNEL

William Bodey, Galion, O.—This is simply a metal funnel for filling lamps, made of conically tapering shape, with a side slot for inserting the spout of the oil can.

IMPROVED COMBINED DATING AND CANCELING STAMP.

Joseph Jay Scholfield, Salt Lake City, Utah Territory.—This invention consists in the particular construction of a postmarking stamp and a canceling stamp made in one and the same piece, in combination with a vertically moving handle held up by a spring, which handle is provided with a laterally attached and interiorly screw-threaded tube or sleeve, which, passing down over a screw threaded shaft carrying the canceling disk, causes the latter to revolve, which, being provided with a series of sharp pins, tears a series of concentric circles and blots the postage stamp at the same stroke, at which the postmark is made.

TOOL FOR SHAPING THE NECKS OF GLASS BOTTLES.

John L. Stewart, Elliott City, Md.—This invention relates to the construction of a tool for forming the necks of that class of bottles which are to be closed by a stopper, having a bit upon the lower end, which, when turned, binds against a cam ledge. The invention consists mainly of a pair of jaws carrying a centrally located rod, surrounded by a loose tabular sleeve. The rod and sleeve each carry a key-shaped bit; and as the jaws clamp the neck of the bottle and are turned, the bit of the sleeve, being imbedded in the plastic glass, imparts to the rotating rod (through a cam) a longitudinal movement, which causes the bit of the rod to form a rising and falling cam in the plastic glass, with a keyhole-shaped orifice for the bottle.

IMPROVED CHEMICAL FIRE EXTINGUISHER.

Jacob B. Van Dyne, Louisville, Ky.—This invention relates to certain improvements in that class of chemical fire extinguishers, which are stationary and provided with a standpipe running up through the different stories. It consists in devices for mixing the chemicals from any of the upper stories without descending to the tank, and in devices for agitating the mixed chemicals simultaneously and with the same movement by which they are mixed.

IMPROVED INDEXING ROLLER.

John W. Dirhold and Henry F. Linnemeyer, St. Louis, Mo.—This invention relates to a novel construction of an adjustable indexing roller, or devices for printing the letters of the alphabet upon the margins of the front pages of a book. It consists mainly of a radial series of type-carrying sockets combined with a central adjusting screw, having a tapering middle portion, which, when the screw is turned, projects the type sockets farther from the center and expands the roller, so as to leave a greater space between the type or accommodate a larger size of type. The said type sockets are held in fixed position by a clamping ring with binding screws, and the device is rolled over the leaves to be printed by means of a detachable handle.

IMPROVED METHOD FOR PREPARING HAMS.

Alden B. Richardson, Dover, Del.—This invention relates to an improved method for preparing hams for the market; and it consists in first withdrawing the bone from the ham, and then packing the ham into a specially constructed can, after which it is hermetically sealed, and then cooked until it is sufficiently done to be ready for the table. The ham is thus cooked with all of its natural juices and flavors preserved; and in consequence of packing and cooking, the space left after the bone is withdrawn is perfectly closed, making the ham solid and homogeneous all through, so that the whole ham may be sliced through and through; and with the exception of a slight seam, the manner of preparing leaves no evidence of the former existence of a bone.

IMPROVED METALLIC SEAL.

Alphonse Friedrick, Brooklyn, N. Y.—This invention consists in the combination, with the compressible soft metal disk or button, having holes therethrough, of a loop made of lead, which is of such low degree of tenacity that when the button is compressed upon its ends the connection of the button with this loop is stronger than the tensile strength of the loop, so that the latter will break before it can be withdrawn.

IMPROVED EMBROIDERY FRAME

Ernest W. Karker, College Point, N. Y.—This invention consists of a couple of parallel rollers in a vibrating frame for holding and adjusting the canvas as the work progresses, the said roller frame being pivoted to a stand, which supports parallel rods below the rollers, on which a work box is fitted to slide along the frame from end to end for convenience of the operator. The roller frame is pivoted to the stand by clamping bolts and nuts, which hold the roller frame at any required inclination. The roller frame may also be used for drawing maps and the like, and is adapted for being mounted on a stand, suitable for field use by engineers.

IMPROVED SPONGE CUP.

William Robert Gratz, Baltimore, Md.—The object of this invention is to provide an improved sponge cup which will not become dry so soon and require such frequent wetting. It consists mainly in a sponge contained in a perforated receptacle maintained in an elevated position in a water reservoir, by means of a spring, so that, as the sponge becomes dry, its humidity may from time to time be renewed by simply depressing the sponge, which brings it in contact with the water in the reservoir.

IMPROVED TAG.

Joseph I. Donahue, Brooklyn, N. Y.—This inventor proposes a new metal eyelet for the string, constructed of two metal disks and fastened to the tag, one at each side. On each are tongues struck out of the hole for the string and locked through the hole of the opposite disk, also through the tag. This makes a very simple and secure contrivance.

IMPROVED OIL CAN.

William Young, Clarkston, Mich.—This inventor attaches to an oil can a small cylinder, having a spring piston. The forcing down of the latter drives the oil out through the nozzle of the can.

IMPROVED PIANO PEDAL ATTACHMENT.

Charles F. Cheesman, San Antonio, Texas.—This consists of a stool with foot levers and connecting wires, so constructed that it can be applied to pianos, for the use of children not large enough to work the ordinary pedals, merely by hooking the stool to the ordinary pedal support and setting the connecting rods in little sockets in the piano pedals.

IMPROVED REVOLVING FIRE ARM.

Freeman W. Hood, Norwich, Conn., assignor to the Hood Fire Arms Company, same place.—This consists in a pivoted spring pawl of the hammer with the ratchet of the cylinder, and a pawl stopping recess of the stock, to securely lock the pawl when the hammer is placed in cocked position. The cylinder may be reversed while the hammer is dropped, and the common stop device entering the notches of the cylinder is dispensed with.

IMPROVED BALE TIE.

James S. Herron, Pensacola, Fla., and Charles R. Herron, Savannah, Ga.—This consists of a band end with a closed L-shaped slot, in connection with the opposite band end, having notches at alternate sides, that lock into the slotted end. The notches are drawn through the L-shaped slot until they bind tightly on the bale.

IMPROVED AXLE GREASE

William Peters, Logansport, Ind.—This is a compound of black oil, hard tallow, wood ashes, white lime, salt, sulphur, and black lead.

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IMPROVED FEATHER RENOVATOR.

Nathan P. Chaney, Pottsdam, N. Y.—The hollow drum for holding the feathers is constructed in two parts, of which the upper one is detachable and reversible for convenience in operating the machine. In the lower part is a perforated tube for introducing the steam, and a canal for carrying off the water of condensation, the canal being covered by a wire screen to prevent the feathers from falling into it. The drum also contains a revolving shaft with arms for stirring the feathers, and there is a steam jacket to the lower part, to which steam is admitted from a suitable boiler.

IMPROVED ANIMAL TRAP.

Henry F. Barnett and William Carpenter, Weston, Mo.—The animal sees the bait upon a hook through the open front end of a decoy box, and, approaching it, he enters the said box, walking upon the tilting platform. His weight causes the back end of the platform or door to descend, and he is precipitated into a lower box, whence he cannot escape. The door returns to a horizontal position as soon as its back end is released from the weight of the animal, and the trap is reset.

IMPROVED SPIRIT LAMP.

Sylvanus S. Robinson, Holden, Mo.—This invention provides an improved combined spirit lamp and blowpipe for the use of mechanics, chemists, and students. It consists in the particular construction and arrangement of a detachable water receptacle or boiler, located above some of the burners of the lamp, and provided with one or more steam pipes with small orifices, which open near one of the burners, so that the heat of a part of the burners generates steam, which, issuing from the orifices of the steam pipes, forms a blowpipe, which directs the flame of the burner outwardly to a point or focus for convenient use.

IMPROVED GAS REGULATOR.

Leander E. Fish, Washington, D. C.—This improvement rests in the construction and arrangement of purifying pans in the base of a gas regulator for the purpose of eliminating the heavy hydrocarbons which would have a tendency to impair the sensitiveness of the regulator. The pans are formed with inwardly inclined sides, so that each pan forms a support for the next one above, the inclination also affording means for lifting out the pans. The improvement further consists in a tapering water sealing trough, which is made by simply attaching a single strip of metal to the perpendicular side of the tank, thus simplifying and cheapening the construction of the seal, and diminishing the chances of overflow. The regulator proper is also of an improved form, being constructed conformably to the principle of the tapering water seal.

IMPROVED PLANISPHERE.

Paul Kuhnel, New York city.—By this device a view of both the terrestrial and celestial hemispheres is obtained, the course of the sun on the ecliptic (and thereby the increase and decrease of the days and nights during the year) illustrated, and also the distance and latitudes of different places on the earth, as well as the steamship connections of the different parts of the globe, indicated. The invention consists of two centrally pivoted and jointly revolving disks, provided with polar projections of the two halves of the earth on one side, and polar projections of the heavens on the other side. The ecliptic is indicated by arc-shaped grooves, along which a movable carriage, representing the sun, traverses. A graduated scale indicates the latitude and distance of any point on the globe.

IMPROVED FIREMEN'S SUITS.

John W. Ostberg, Stockholm, Sweden.—This is an air and water proof suit that covers the entire body, and is continually flooded with water, which is introduced by pipe connection with the hood, covering the head gear or helmet of the dress. The helmet is tightly applied to the body-covering dress, and the dress strapped to the body, air being supplied to the inside to keep out the smoke by an air supply pipe and pump. The helmet is provided with a hollow valve mask, through which the water is continually flowing, passing by a connecting tube to the hood that is fitted on the face mask and extended over the dress to shed the water over the same.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CORN PLANTER.

John V. Reams, Midland City, Mich.—The essential features are ingenious and novel devices, for throwing the seed-dropping mechanism out of gear and raising the furrowing plows from the ground simultaneously, and also for operating the seed wheel independently, when thrown out of gear with the revolving axle.

IMPROVED PLOW.

William R. Pool, Havana, Ala.—This invention consists in a stock, which is combined with a forked piece, having sharp projections and a pair of blocks. The attachment is used with a narrow share for forming a smooth surface at bottom of furrow for the reception of cotton seed, and the working face is provided with forks that embrace the standards, and are fastened thereto by a bolt or rivet. It has also a shoulder. Small blocks press out the upper part of the furrow, that it may more conveniently receive manure and corn when the same are to be inserted.

IMPROVED FENCE POST.

Eugene Powell, Delaware, O.—The upper ends of wooden blocks inserted in the ground are notched transversely to receive the cross nead, which is made of wrought iron, bent to form eyes, which receive the sharpened ends of the stakes. The ends of the rails of the adjacent panels are placed alternately between the stakes and one upon the other. The upper ends of the stakes are secured to each other by staples.

IMPROVED ANIMAL-WEANING BITS.

Alfred Bartlett and Alfred J. Bartlett, Jr., Toledo, Iowa.—This is an improved anti-sucking bit for calves, etc., which is not liable to be stopped up by hay or grass, and which allows the ready removing of the same without taking the bit out of the mouth of the animal. It consists of a hollow bit, with central perforated swell, stationery end loops, and open ends. It is cleaned by introducing a wire rod through its hollow portion.

IMPROVED PLOW.

Asa H. Piland, Margarettsville, N. C.—This relates to plows of that class in which detachable sweeps are employed, for the cultivation of cotton and corn in the earlier stages of its growth; and it consists in the peculiar construction of a combined moldboard and sweep or bat wing, made in a single piece, whereby, it is claimed, the plow is enabled to stand much greater service and harder strains without requiring repairs.

IMPROVED WIRE FENCE BARB FORMER.

Rheubin H. Pooler and William T. Jones, Serena, Ill.—The object of this is to apply three-pronged barbs to the wires of wire fences. In applying the barbs, the single prong is inserted in the cavity of a pair of pinchers, with the outer side of each parallel prong resting against a jaw of said pinchers. The barb and pinchers are then made to straddle the fence wire, and the pinchers are closed, which forces the parallel prongs across the wire in opposite directions. The pinchers are then opened and removed, leaving the barb firmly attached to the wire.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED CHILDREN'S CARRIAGE.

William E. Crandall, New York city.—The body of the carriage has the two frames of its top, the cover, and sashes in the frames made severally independent and detachable to facilitate packing and transportation.

IMPROVED ADJUSTABLE KEY GUARD.

James S. Wilson, Trenton, N. J.—This device includes a bar which, after the door is looked, is slipped into the keyhole beside the key and is turned partially round. Attachments of the bar are then firmly secured to the key handle, so that it is impossible to turn the key without first detaching the said device, and that cannot be done from the outside of the door.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SOLDERING TOOL.

August Goetze, Baltimore, Md.—This invention relates to an improved construction of soldering iron especially adapted to capping cans of preserved fruits, vegetables, oysters, and other articles of food. The invention belongs to that class of soldering irons in which the copper block is attached to a hollow tube which is provided with a handle and adapted to be rotated about a central shaft, and also made vertically adjustable thereon. The improvement consists in the mode of attaching the soldering blocks to the tube to insure greater strength and durability.

IMPROVED SELF-ACTING GRAPNEL.

Jean Baptiste Toselli, Paris, France.—According to one arrangement, this grapnel is expanded by being suddenly raised while immersed in the water. The second arrangement, on the other hand, is made to expand by the act of lowering in the water; but in both cases the resistance of the water is the agent by which the arms of the grapnel are caused to expand or close together without any mechanical aid. This device, which is as simple as it is ingenious, will be found fully described and illustrated on page 214, volume XXXI of this journal.

IMPROVED TRACK CLEANER.

Silas T. Bentley and Jacob Estep, Union, Iowa.—This invention relates to a novel construction of machine mounted upon a platform car, to be used for cleaning snow from railroad tracks whenever the same become blockaded by drifts. It consists in the particular construction of a derrick mounted upon a platform car and pivoted in the center so as to turn readily to one side, with the devices operating in connection therewith. Said derrick carries at one end a frame work in which is pivoted a scoop which may be raised and lowered by a windlass with pulleys and a cord attached to a bale on the said scoop. To the derrick above the scoop is pivoted a frame carrying a cut-off for the scoop after it is forced into the snow bank, which cut-off divides the snow in the scoop from that outside, and is operated through a cord, pulley, and windlass. The rear of the frame carrying the scoop is provided with a spring catch, with cord and windlass for dumping and restoring the scoop to its proper position upon its pivots.

IMPROVED RAILROAD RAIL.

Samson Sutton, Lisbon, Iowa.—This is a railroad rail constructed of two symmetrical rail sections joined in longitudinal direction and having a central wooden core. As the joints of the rail sections reach only half way across the rail head, the other half bears the wheel, and allows the wheels to pass thereby over any shrunken joint without battering, jolting, or breaking.

MACHINE FOR DESCRIBING AND CUTTING REGULAR CURVES.

Frank A. Polsley, Jackson Court House, W. Va.—In using the machine to describe a curve, a cone is so adjusted that, when revolved, the edge of a wheel may describe the required curve upon the face of the said cone. The paper upon which the curve is to be drawn is secured to the table, and the pencil is adjusted to rest upon it. Then, by turning the table, the point of the pencil will describe the desired curve. When the curves are to be cut, a table is substituted which has two dovetailed grooves formed across its face at right angles with each other, and intersecting each other at the center of the table. In these grooves are inserted four dovetailed blocks, to which are attached two pins at a little distance apart, to receive and hold the object to be cut. The blocks are so adjusted that the cutter, while cutting the curve, may pass between the pins.

IMPROVED PISTON PACKING.

William W. St. John, Pisgah, Mo.—This consists of a piston packing wider on the under side than elsewhere, for the purpose of bearing the weight of the piston and piston rod, in addition to the packing pressure, without greater wear than in the other parts.

IMPROVED WATER WHEEL.

Nelson M. Prince, Concordia, Kas.—This is a contrivance of two gates, so pivoted on opposite sides of the wheel and connected together that the water pressure is balanced. It is claimed that the gates work easier, and the form is such that each one makes two chutes, through which the water enters upon the wheel tangentially, giving good results.

IMPROVED BOOT HEEL AND EDGE POLISHING MACHINE.

Leopold Graf, Newark, N. J.—This is a polishing machine for finishing the edges of the heels and soles of boots and shoes, whereby two polishers—one for the heel and the other for the sole—are operated by one and the same driving shaft, in such manner that both operations may be carried on at the same time. There is, beside, a simpler and better contrivance of the gear by which the polishers are operated; an arrangement for obtaining a better action for the polishers, and a higher speed of them for a given speed of the driving shaft, an improved contrivance for gaging the polishers to edges of different thicknesses, and of an improved clamp frame for holding the shoe.

IMPROVED HOLDER FOR GRINDING NEEDLES.

Henry M. Dixon, Brooklyn, E. D., assignor to himself and Robert E. Dunham, Jamaica, N. Y.—This consists of a little tube with notches in the side, suitably shaped for inserting sewing machine needles, so that the points will project at the end suitably for grinding them. The tube forms a holder, which can be held and turned uniformly, so as to grind the points round and true.

IMPROVED FIRE ENGINE.

Clinton W. Clapp, Wappinger's Falls, N. Y.—This consists of a couple of receivers for carbonic acid gas and a steam pump, so combined and fitted with hose and nozzle for discharging the water and the gas that, by alternately charging the receiver and working off the gas through the pump, the gas can be employed as the motive agent for the pump, and, at the same time, the exhausting gas can be used separately or together with the water for extinguishing the fire.

IMPROVED MIDDLINGS SEPARATOR.

Morris N. Elwell, Oneonta, N. Y.—This inventor proposes a vertical draft box, in the upper part of which are a number of inclined slats, for breaking and distributing the stream of middlings and the current of air. Said slats are at the entrance of a horizontal box, along which the particles carried over from the vertical box are carried over a hopper, into which the final separation is made by a lighter current up the spout. The middlings are fed into the upper end of a box from a hopper, shoe, and regulating slides, and the bran is discharged through a fan. Below this apparatus is a duplicate set, in which the middlings are treated again in the same manner by air currents set in motion by another fan.

IMPROVED WATER WHEEL.

Henry Waltner, Hamilton, Ohio.—This invention consists of buckets hinged to the periphery of the wheel to close in for passing cut-off partitions, employed to utilize the dead pressure of the water. The said buckets are provided with an arm which extends inside of the periphery of the wheel and strikes a stud on the lower part of the case. This throws out the bucket so as to take the water immediately after passing the cut-off. Among the advantages claimed is that the device works with any head of water, also under back water. It employs the whole periphery of the wheel for the utilization of the water power, and gives the advantage of the full pressure of the solid column of water of a given head of water, without the necessity of an accelerated motion.

IMPROVED PUMP.

Benjamin Eby and Jacob S. Fiester, Kinzer, Pa.—To the pump barrel beneath the frost line is attached a right angled spout, against the mouth of which is pressed a valve. The valve is pivoted to an arm attached to the spout, and to its inner end is attached the lower end of the connecting rod, which is pivoted to a trigger, which is pivoted to the pump barrel in such a position that, when the handle is lowered, it may strike and press it downward, uncovering the mouth of the nozzle and allowing all the water above the frost line to flow out, so that it cannot freeze. As the handle is raised to work the pump, the valve plate is again raised against the spout by a spring, to prevent the entrance of air into the pump barrel.

IMPROVED LIFTING JACK.

David Hiltabidle, York Road, Md.—This invention relates to that class of lifting jacks in which two lifting links are pivoted to an oscillating lever upon opposite sides of its fulcrum, and are arranged to operate alternately upon opposite sides of a double ratchet bar to lift the load. The invention consists in the construction and arrangement of devices operating in connection with the links for the purpose of releasing them from the ratchet bars.

IMPROVED PROPELLER FOR BOATS.

John W. Dolch and George Haydn, Baltimore, Md.—This invention belongs to that class of propellers in which a long spiral propeller is arranged to revolve in a cylindrical channel in the bottom of the boat, which channel opens into the water at both ends, and through which the water is discharged by the revolutions of the propeller to urge the boat forward. The invention consists in making the cylindrical channel with a detachable upper half, which is fastened by means of bolts to the said lower half, the upper detachable portion being provided with hangers, in which the ends of the propeller shaft are journaled so that the propeller is removable with the upper section of the channel.

IMPROVED SHINGLE MACHINE.

Moses Stewart, Dallas, Texas.—The object here is to improve the construction of the shingle machine known as the Evarts rotary twelve-block shingle machine, in such a way as to prevent the blocks from jumping when the dogs strike them. The invention consists in an incline formed upon the rear ends of the guide plates for the stems of the dogs to slide down upon, so that the dogs may take hold of the blocks gently and without moving them from their place.

IMPROVED RUDDER-INDICATING APPARATUS FOR VESSELS.

Justus A. Briebach, Clapton, England.—This is a device operated automatically by the rudder for the purpose of showing, at a distance, the position of said roller, and, consequently, the direction in which the vessel is steering. The rudder is connected by rods to colored glass slides in a lantern, located in the forward part of the vesse.. When the rudder is amidships, the slide carrying the colored glasses will be in its central position, and an equal amount of light of each color will be exhibited through the opening of the lantern; but when the rudder is moved over in one or other direction, the slide will be raised or lowered, and a greater amount of one or other color will be exhibited.

IMPROVED SAFETY APPARATUS FOR RAILROADS.

John B. Prohias, New York city.—This invention consists of an elevated rail at each side of the track and hook-shaped or grooved roller projections attached to the car. In case the main rails sink or otherwise fail, or the car wheels or axles break, the cars will catch on these side rails by the projection, and thus be prevented from injury. The contrivance is also designed to be such that, in crossing places where the ordinary rails cannot be well laid, the cars may run altogether by the grooved wheels on the guard rails, the latter being firmly supported on piles, and the wheels being suitably connected with the power.

IMPROVED MACHINE FOR FINISHING BARRELS.

Edmund W. Gillman, Long Island city, N. Y.—This is an apparatus for evening the staves, pressing on the hoops, dressing off the ends, and crozing and chamfering the barrels. The barrel, having truss hoops, is rolled into position between the presser rings, which at the time rest between the pushers. The latter are then pushed forward so as to press the ends of the staves strongly between the rings, to even the staves lengthwise. Pressure is next applied against the hoops, for pressing them on and tightening up the joints of the staves. As soon as the staves are pressed endwise and evened by the rings, they are dressed off true by a rotary cuttery. A gage then runs against the ends of the staves to gage the distance of the evening, crozing, and chamfering tools from the ends, said tools being carried by a rotary cutter head.

IMPROVED GOVERNOR.

Bernard W. Johnson, Barry, Ill., assignor to himself, Joseph D. Partello, and John M. Ryan, same place, and Miller T. Greenleaf, Quincy, Ill.—Through the lower part of the valve stem passes a lever pivoted to some suitable support. The lever passes through a cage, in which is inclosed a glass cylinder half filled with mercury. The governor is so adjusted that the cylinder may be in a horizontal position when the governor is running at its proper speed, with about half the machinery to be driven in gear with the engine. If, now, some of the machinery is thrown out of gear with the engine, the rise of the balls tends to close the valve, and also raises the outer end of the cylinder. This causes the mercury to flow toward the inner end of said cylinder, and changes the leverage, so that the engine does not have to keep up its speed to keep the valve closed. If, on the other hand, more machinery is thrown into gear with the engine, the balls lower, and the outer end of the cylinder is depressed, causing the mercury to flow toward the outer end of said cylinder, giving more leverage against the centrifugal force of the balls, and bringing the engine to its proper speed quicker than the balls could do alone.

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Business and Personal.

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Agricultural Implements and Industrial Machinery for Export & Domestic Use. R.H.Allen & Co., N.Y.

How to lay out the Teeth of Gear Wheels. Price 50 cents. Address E. Lyman, C. E., New Haven, Conn.

Wanted—Inventors of Harrows and Harrow Teeth, to send samples of teeth, descriptions, and price for right, to "Harrow Co.," Dayton, Ohio.

Wanted—At low prices, good small 2d hand Iron Planers, Lathes, Drill Presses, and other Machine Tools. Send particulars to J. & H. Kelsey, 186 Kentucky Avenue, Indianapolis, Indiana.

Owners of Steam Engines—We guarantee 25 per cent extra power or an equal saving in fuel, by applying the Ransom Syphon Condenser. T. Sault, Consulting Engineer, General Agent, New Haven, Conn.

Wanted—A first class mechanical draughtsman. Address, with particulars, Draughtsman, Box 639, Providence, R. I.

Steel and iron drop forgings all shapes, ¼ oz. to 5 lbs., far superior to malleable and steel castings. Steel slide wrenches a specialty. Call before purchasing elsewhere. Wm.Rose,Bro.& Co.,36 & Filbert sts.,W.Phila.

Wanted—A man (fully competent) to erect and take charge of a Cotton Batting and Wadding Factory. Address, with references, J. M. Ferguson, 440 Prytania St., New Orleans, Louisiana.

We have on hand a large lot of Machinist's Tools, second hand, which must be sold in order to close up an old partnership. For pamphlet, giving full description of each tool, address Steptoe, McFarlan & Co., 214 West 2nd St., Cincinnati, Ohio.

Wind Mill Rights Cheap—One county in each State to give for introducing the mill. For terms, &c., address E. S. Smith, Good Hope, Ill.

Wanted—Address of Makers of Papier Maché Ceilings. Address J. Parmelee, Des Moines, Iowa.

The French Files of Limet & Co. have the endorsement of many of the leading machine makers of America. Notice samples in Machinery Hall, Centennial Exposition. Homer Foot & Co., Sole Agents, 22 Platt St., New York.

Wanted—The agency of some good Engines, Boilers, Machinist's Tools, and Wood-working Machinery; also Steam and Gasfitter's Tools, Brass Goods, &c. Address G. H. B., 213 North Fourth St., Philadelphia.

Top for Baby Carriages—Pat'd March 14, 1876. Rights for Sale. Address W. E. Crandall, 569 3d avenue, New York city. See notice on page 281.

Second Hand Machinery—Large Stock of Iron and Wood Working Machinery in Store at Great Bargains. George Place, 121 Chambers and 103 Reade Sts., New York.

Vertical Tubular Boilers, all sizes. Send for price list. Lovegrove & Co., Philadelphia, Pa.

For 2nd Hand Portable and Stationary Boilers and Engines, address Junius Harris, Titusville, Pa.

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Bung Machine Makers—Please send address or circular to W. H. F., Box 773, New York city.

Bargains in new and second hand Machinery. Send for our printed list, No. 5, describing 300 machines. Forsaith & Co., Manchester, N. H.

Centennial Exhibitors, buy your Belting in Philadelphia, from C. W. Arny, 148 North 3d St., and save freight and trouble. Satisfaction guaranteed.

Wanted—2d hand battery for Electric light; also Induction Coil. Particulars to J. T. O'Connor, 151 West 41st St., New York.

Wanted—Charge of Weaving Department, Cotton or Satinet, by a practical, experienced man. Address A. B. C., P. O. Drawer No. 5, Greenville, N. H.

Wanted—Tubular Condenser. Boston P.O., 3396.

Wanted—Steam Pump, about ½ horse power, to use Kerosene for fuel. Box 1, Andover, Mass.

Wanted—To purchase the Patent of a good and cheap Burglar Alarm, or will manufacture and pay royalty. Address, with full particulars, B. H. Robb & Co., 186 Vine St., Cincinnati, Ohio.

Trade Marks in England.—By a recent amendment of the English laws respecting Trade Marks, citizens of the United States may obtain protection in Great Britain as readily as in this country, and at about the same cost. All the necessary papers prepared at this Office. For further information, address Munn & Co., 37 Park Row, New York city.

Friction Hoisting and Mining Engines.—J. S. Mundy, 7 R.R. Ave., Newark, N. J.

Split-Pulleys and Split-Collars of same price, strength, and appearance as Whole-Pulleys and Whole-Collars. Yocom & Son, Drinker St., below 147 North Second St., Philadelphia, Pa.

Gas and Water Pipe, Wrought Iron. Send for prices to Bailey, Farrell & Co., Pittsburgh, Pa.

Shingles and Heading Sawing Machine. See advertisement of Trevor & Co.,Lockport, N.Y.

File-cutting Machines. C. Vogel, Fort Lee, N. J.

Yacht & Stationary Engines, Sizes 2, 4, 6 & 8 H.P. Best for Price. N. W. Twiss, New Haven, Conn.

Inlaying and Fret Sawing in Wood, Shell, Metal, &c. See Fleetwood Scroll Saw, page 188.

$1,000 for any hand sawmill equal to A. B. Cohu's, 197 Water St., New York.

Solid Emery Vulcanite Wheels—The Original Solid Emery Wheel—other kinds imitations and inferior. Caution—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, New York.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

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Peck's Patent Drop Press. Still the best in use. Address Milo Peck, New Haven, Conn.

All Fruit-can Tools, Ferracute W'ks, Bridgeton, N.J.

Notes & Queries

A. B. can color gold by the process described on p. 363, vol. 33.—P. M. H. will find an answer to his question concerning the commencement of the day on p. 401, vol. 28.—B. E. will find a description of the toughened glass on p. 402, vol. 32.—R. F. B. P. can cement straw boards together with marine glue. See p. 43, vol. 32.—F. B. L. can make an excellent incubator by following the description on p. 273, vol. 33.—J. S. can find a good recipe for cement for glass on p. 379, vol. 31.—F. S. H. can prevent rust on his skates by the method given on p. 169, vol. 33.—W. F. F. can find a description of bisulphide of carbon on pp. 306, 368, vol. 28. The numbers are out of print.—H. E. J. will find full directions for setting shafting,etc., on p. 388, vol. 31.—B. H. will find a recipe for hair stimulant on p. 138, vol. 33.—P. F. will find mention of a process for making gas from coal oil on p. 65, vol. 32. Coal gas is purified by passing it through quicklime.—C. A. W. will find directions for taking casts on p. 58, vol. 24. In molding the male human face, the beard, etc., should be well oiled to prevent its adherence to the mold.—W. H. B. will find directions for bluing iron and steel on p. 123, vol. 31.—B. L. can make sulphate of indigo by the process given on p. 250, vol. 34.—B. P. F. will find directions for utilizing bones on p. 251, vol. 28.—D. N. C. will find a recipe for a black enamel on iron on on p. 208, vol. 26.—A. H. S. will find that rice glue is a good cement for making transparent cards. See p. 155, vol. 32.—J. C. S., Jr., will find a recipe for remedying the rancidity of butter on p. 119, vol. 30.—C. H. S. can raise his water by wind power. See p. 241, vol. 32.—J. L. W. will find a description of the Russian circular ship on p. 87, vol. 32.—W. E. will find a recipe for rubber cement on p. 203, vol. 30.—H. F. P. can extract silver from waste solutions by the method described on p. 249, vol. 29.—W. C. M. will find directions for making carmine red ink on p. 200, vol. 30.—E. S. A. will find directions for making Professor Tyndall's respirator, which is suitable for his purpose, on p. 178, vol. 32.—X. Y. Z. will find directions for building a windmill on p. 241, vol. 32.—R. D. T. will find a description of soluble glass on p. 315, vol. 31.—E. R. will find directions for making sulphate of indigo on p. 250, vol. 34.—C. C. will find directions for making imitation rosewood on p. 154, vol. 30.—J. P. will find directions for gilding on wood on p. 90, vol. 32.—F. V. D. C., G. W. D., W. K., F. W., and G. R. S., who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) J. H. B. asks: Can you tell me how bevel gears are tapered on a regular gear cutter? A. The chucking spindle is made adjustable, to suit the taper.

(2) J. M. H. says: The brasses on the forward end of a locomotive's main rods are continually wearing out, not quite so much on one side as on the other. The brasses are hard, yet they do not heat nor cut. I have to chip and file the brasses a great deal too often for the amount of work done. The engine works well and we make good time with her. A. It is probable that your journals have not sufficient wearing surface, or else the brasses are not made of the proper mixture of metal.

(3) G. V. B. asks: At what speed should I run a polishing wheel 2 feet in diameter, on which flour emery is used with oil? A. At 320 revolutions per minute.

(4) X. Y. Z. says: I am preparing a machine to split pieces of wood 2 feet long and 6 inches in diameter by means of two axles working horizontally and connected by an axle with a double crank or a fly wheel. The wood is about as hard and splits like pine. About what size and weight of fly wheel do I need to work the machine by water power? A. If you make a fly wheel 3 feet in diameter,with a rim having a cross section of 12 square inches,we think it will answer. 2, Is there danger to the axle in such an arrangement? A. You need apprehend no danger if you make the axle of ample proportions.

(5) H. F. asks: What is the best water proof cement, that the sun will not affect, for putting glass tiles in iron frames? A. Use a cement made of white lead ground in oil, with as much dry red lead added as will make it to the proper consistence. Cut up some hemp into short fibers, and mix the whole by well hammering and kneading it.

(6) J. A. L. asks: 1. How large a boat would it require to carry 6 or 8 persons? A. Make a boat 18 to 20 feet long. 2. What kind of boiler and engine will be best? A. Use an engine 3 x 3 inches, and a boiler 28 to 30 inches in diameter and 4 feet high. 3. Will the man running the engine have to get papers licensing him to run her? A. It will be necessary to have a licensed engineer.

(7) S. C. H. asks: In heating a large piece of steel to temper it for cutting wood, it scales off. Would it do to put the steel in molten lead instead of heating it in the fire? A. Yes. Heating in lead will answer excellently.

(8) R. P. asks: 1. What would be the striking force of a man weighing 150 lbs., jumping from a railroad train running at the rate of 30 miles per hour, the distance from the car to the ground being 4 feet? A. The amount of work to be overcome in bringing the man to rest would be:

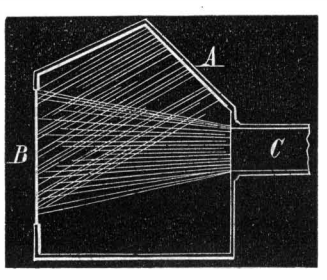
$$\text{His weight} \times \frac{(\text{velocity in feet per second with which he strikes the ground})^2}{64{\cdot}4}$$

Now if you can find through what distance this resistance is overcome, by the compression of the earth and of the man, the quotient of the whole work in foot lbs., divided by this distance in feet, will be the striking force in lbs. 2. If 2 men of the same weight jumped from the same hight, could one strike the ground with less force than the other? If so, why? A. From the above answer, you will see that if one jumped harder than the other, or if he or the ground on which he jumped were more compressible, there might be some difference in the striking forces,which would, however, be sufficiently severe in any event.

(9) F. P. asks: How can I make the cores for the steam ways for an engine 1½ x 3 inches? I have used 1 part clay and 1 part molder's sand, but it falls to pieces. A. Strengthen the cores with wires.

(10) F. E. H. asks: How do you measure a safety valve? I measure it as follows: I hang the lever on a spring balance at the point where the valve rests, the lever and valve showing a weight of 20 lbs. Then I measure the bottom of the valve, which is conical, the bottom being of the size of the pipe on which it is placed. It was 4 inches in diameter, and the weight on the end of the lever was 50 lbs. The lever is 24 inches long in all, the short end being 4 inches from the fulcrum. I calculate as follows: 4×4=16×0·7854=12·5664 square inches area of valve. Lever is 24 inches long, short end 4 inches: 24÷4=6×50 lbs=300 lbs.+ 20 lbs. for lever and valve=320 lbs. 320÷12·5664= 25·4+lbs. steam. Am I right? A. If the valve fits perfectly tight, it is proper to measure the lower diameter; but if it leaks, the steam acts on an area corresponding to the larger diameter. You seem to have made a mistake in your calculation. The weight of the valve and lever acts at their common center of gravity, which can be found by balancing the lever on a knife edge.

(11) F. P. asks: Can stereoscopic views be reflected upon a white curtain in a dark room, so that they can be shown and explained to a company of spectators? A. Yes. It can be done by attaching a box,as shown in the accompanying engraving,to an ordinary magic lantern at A,the picture being placed at B and the objective at C. The light coming from the condenser is reflected from the picture and passes through the objective, and the image is formed on a curtain at a short distance from it in front.



(12) J. D. G. says: I have an upright vessel containing 10 gallons, with a watertight piston on the top. What weight would be required on the top of piston rod to make a pressure of 40 lbs.? A. If you mean a pressure of 40 lbs. per square inch, it would be necessary to have a weight equivalent to the weight of a column of water having the diameter of the vessel, and a hight of about 93 feet. To find approximately the weight of such a column of water, multiply the cross section of the cylinder in square feet by 5,800.

(13) J. L. and others.—In the United States marine engineers are licensed by the government inspectors, after passing satisfactory examination on the principles, management, and repair of steam machinery.

(14) G. A. B. asks: I am going to put up a fountain, and I have no water supply but a well. I propose to put a tank on a shed which is 24 feet high and 60 feet from the proposed location of the fountain. 1. Is it practicable? A. Yes. 2. Would a 40 gallon tank give as much force as a 100 gallon one? A. Yes, if of the same hight. 3. What size of pipe would be suitable? A. Use a ¾ inch pipe. 4. Which would be the best, lead or iron? A. Iron pipe coated with tar and laid 3½ feet in the ground. 5. About how high would it play through a ⅛ inch hole? A. Not very high. 5. What would you advise me to do? A. To provide a much larger tank and set it much higher, so that your fountain may play higher and the supply of water last longer.

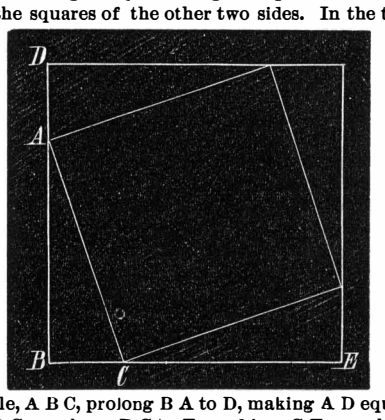
(15) T. S. O. asks: Are the finest fret saws stamped or filed out? A. Stamped.—J. E. E., of Pa.

(16) C. S. says: I have put a burglar alarm in a house; it has been in use 3 months and works well, but in one place where the 6 wires run they seem to get eaten off as with acid. It occurs where the wires run through a brick wall. What is the cause? A. It is caused by the electricity which flows across the moisture on the wall and destroys the wire by local action.

(17) A. B. asks: How much silk-covered copper wire and what number of wire do I want to wind on a soft iron core 3 inches long by ⅜ diameter, to lift the greatest weight? A. Use 100 feet of No. 14 copper wire.

(18) E. C. T. asks: 1. If a circular saw, 10 inches in diameter, must run 3,000 revolutions per minute to do good work, how fast must saws 6 and 4 inches in diameter, respectively, run to do good work? A. A 10 inch saw should run at 3,600 revolutions per minute, a 6 inch saw 5,000, and a 4 inch saw 7,300; half the above speed will answer, and the saws do good work. 2. Is it possible to get sufficient speed to run a 4 or 6 inch circular saw, with two pulleys, the driving pulley of 20 inches diameter and 1¼ inches face, weighing 20 lbs., driven by a foot treadle? A. We do not think you can get speed enough unless you use gears, or use an intermediate shaft between treadle and pulley, to increase the speed. 3. Can I successfully run a scroll saw, the treadle furnishing motion to the abovenamed 20 inch pulley, and this pulley to the smaller one by friction,effectively and without slipping? A. We should think so, if well constructed. 4. Should both pulleys be faced with leather or rubber, or only one, and which one? A. Either will answer. Rubber makes an excellent friction face. The large wheel may be faced with rubber or leather, and the small one should be wood or iron. 5. What should diameter of smaller pulley be? A. About 2 or 2½ inches diameter will answer for the small wheel.

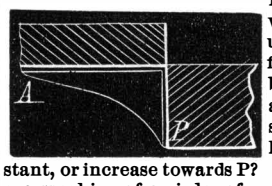
(19) J. D. L. says: The following is, I believe, a new solution of the well known Pythagorean problem, Euclid I,47: The square of the hypothenuse of a right angled triangle is equal to the sum of the squares of the other two sides. In the triangle, A B C, prolong B A to D, making A D equal to B C; prolong B C to E, making C E equal to A B, and complete the square. Erect a square on A C. Then we have (A B+A D)²=area of larger square. But this area is composed of the area of the four triangles (which, having the sides equal, each to each, are equal to each other) and the square of A C; hence (A B×A D)+2×4+A²=area of larger square. Then D B²=A B²+2 (A B×A D)+ A D²=2(A B×A D)+A C². Therefore A B²+AD² =A C².



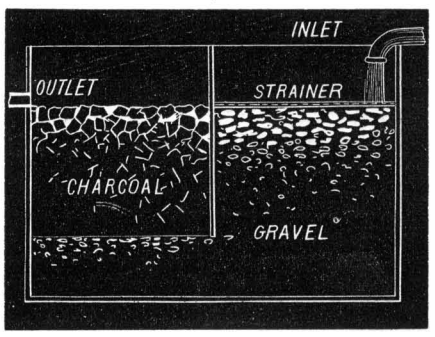
(20) L. K. asks: I have a box made of black walnut. Some parts of it are nicely covered with a fine coat of copper. How is it put on? A. By first covering the box with wax, then with black lead, and then depositing by the regular electrotype process.

(21) G. E. Y. asks: What is the difference if any, between the temperatures of steam and water in a boiler, at from 10 to 50 lbs. per square inch? A. In ordinary practice, there is probably only a difference of a few degrees in the two temperatures: but by depriving the water of air, and heating it gradually, the temperature of the water has been increased more than 100° above the temperature of the steam.

(22) W. M. says: A girder has the load uniform and top flange with sectional area uniform, the lower flange being a parabola whose vertex is at A. Should the sectional area of lower flange be constant, or increase towards P? A. Constant, if you are speaking of a girder of uniform strength.



(23) F. W. S. says: I am using hydrant water for brewing purposes; but it is contaminated by mud and organic matter. Can I get rid of the organic matter by filtering, and would this be a good form for a filter? A. Your plan is an admirable one, and, we think,will answer all the requirements of the case. The columns of sand and charcoal should be about 10 feet high and about 5 feet in diameter. Use well washed gravel and only perfectly carbonized charcoal. If the latter provision is not carefully attended to, the water may become still more contaminated by contact with the green charcoal.



(24) J. H. T. asks: I wish to make a relay for a short telegraph line. I have about 6 ozs. No. 22 silk-covered wire. Will you please tell me of what size and length the iron core should be to get the best results, the current being very weak? A. About ⅛ inch wide by 5 inches long. 2. Does it take more wire to magnetize a ⅛ inch bar than it does a ¼ inch one with the same current? A. Yes.

(25) W. W. asks: Is there anything in the form of a one half balance wheel applied to the shaft of a sawmill? A. The half balance for a sawmill shaft is old. It is a very common way of counterbalancing the weight of gate and pitman. —J. E. E., of Pa.

(26) J. D. W. asks: Do thermostats made of brass and steel last or act well for a considerable time? A. If properly constructed they do.

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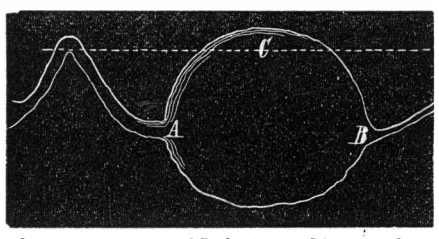
(27) J. F. R. says: I am building an icebox 8 feet deep, 8 feet high, and 5 feet wide, ice being suspended in a grate. There is an air chamber inches wide all round it. Is ventilation necessary? A. A certain amount of ventilation is necessary. We would suggest an opening 3 inches in diameter upon one side at the bottom, and a like opening upon the opposite side at the top, these openings should be covered with wire cloth. The openings should communicate with the interior and not with the 2 inch space.

(28) D. P. W. asks: If a *tuba mirabilis* stop in an organ be weighted 18 inches water gage pressure of wind, what will be the relative pressure on a steam gage? A. About 0·65 lb. per square inch.

(29) A. C. C. asks: Does the friction increase with the diameter of the journal, the weight and the velocity remaining constant? A. Under these circumstances the friction would not vary.

(30) J. E. D. asks: 1. Will quicksilver remove the lead from gun barrels? A. Yes, but the black lead (carbon) and oil with which the bullets are covered, and the percentage of arsenic with which the metal is alloyed, often renders this method unsuccessful. 2. If so, how can the lead be separated from the quicksilver so that the latter can be used again? A. Heat the alloy in a suitable iron retort, the beak of which, or its connection, must dip beneath the surface of a quantity of water. The mercury will distil over and condense beneath the water, while the lead will remain behind.

(31) J. S. O. says: The generally accepted theory of intermittent springs is that a cavity in the earth has two water channels, one leading into it, the other out, the former being the smaller, as in the engraving, which represents the section of an intermittent spring. Let A be the outlet, 2



inches in diameter, and B the inlet. If water flows in through this channel, it will rise to the level, C, and instead of filling the channel, A, which is necessary to create a siphon, it will flow out in a steady stream as long as water flows in at B. Can any one give another theory to take the place of the long accepted but evidently incorrect one? A. In accounts of several intermittent springs which we have seen, it is stated that the water first issues with great velocity, and runs for some time with a continually decreasing velocity. It would not be difficult, therefore, to believe that the cavern might be so supplied as to be full at times, the supply being sometimes greater than the discharge and sometimes less. Perhaps some of our readers have devoted more attention to the subject than we have, and will send us their views.

(32) W. F. T. asks: 1 How high will an hydraulic ram raise water? A. In general, it should not be more than 15 times the head under which the ram works. 2. If I attempt to raise all the water that runs from my spring with an hydraulic ram, what proportion of the water will the ram raise? A. It may raise from ⅛ to $\frac{1}{10}$ the whole amount. 3. Can an hydraulic ram of any size be made to work, or is there a limit to the size at which it can be made to operate successfully? A. As a general thing, the size of a ram is approximately fixed by the conditions under which it has to work. You will find the whole matter fully explained on p. 259, vol. 31.

(33) B. W. S. says: The head of a horse rake, being green when manufactured, has warped in drying. How can I remedy the defect? A. Possibly by steaming the wood, and securing it in the proper position, you may give it the original shape.

(34) M. W. H. asks: At what angle should a rifle be held to throw a ball to the greatest distance over level ground? A. A general value would be difficult to ascertain. In practice, the angle will probably be between 30° and 40°.

Can a horse do more work walking at 30 or at 60 yards per minute, in both cases pulling his best for the space of one minute? A. He could probably do more, for a short time, at the greater speed.

What steam pressure would a vat (made of grooved and matched 2 inch oak plank, of 10 feet hight and 8 feet diameter, sustain, being bound with nine ¼ x 2 inches iron hoops? A. Between 30 and 40 lbs. per square inch.

(35) R. H.—If, as we understand you, the thrashing machine runs with sufficient steadiness at present, we do not see that any advantage would be derived by using a heavier cylinder.

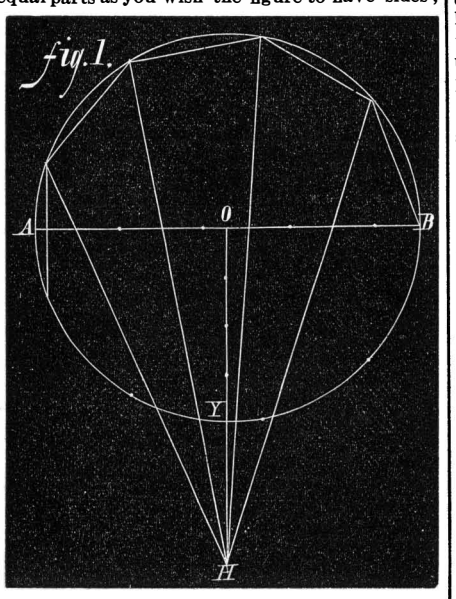
(36) C. W. C. asks: 1. Is a screw steamer, of 1,000 horse power, faster or slower than a side wheeler of the same power? A. In still water the screw would have no great advantage; but in the case of adverse winds and heavy seas, its superiority over the side wheel is very decided. 2. Is a two-bladed screw more powerful than one with more blades, other things being equal? A. Experiments seem to show that screws with two blades are not as efficient as those having three or four, other things being equal.

(37) I. J. H. asks: Can I cover steel-pointed poles with any preparation that will prevent their attracting lightning? I want to use those I have to make a garden fence, but am half afraid to do so. A. Metals do not attract lightning. The idea that they do is a popular delusion.

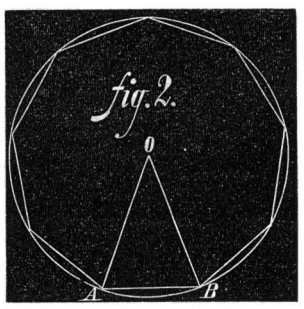
(38) F. A. S. asks: Can you inform me what is the best contrivance for grinding centers in a lathe? A. A revolving emery wheel.

(39) F. N. W. asks: In connecting a tank in the top of a building with the standpipe from the pump, will there be any difference in the pressure on the pipe whether it be connected at the bottom or at the top of the tank? A. If the tank is kept full, there will be no difference. This also answers S. F.'s plumbing question.

(40) S. C. says: I offer the following as an easy method of dividing circles. In a given circle (Fig. 1) divide the diameter, A B, into as many equal parts as you wish the figure to have sides;



erect the perpendicular; O H, divide the radius into 4 equal parts, and set off 3 of these parts from Y to H; draw lines from H to each division on diameter, and produce them to cut the circumference. Join any two of the points by a chord, and it will be the side of required polygon. When the polygon is to have an even number of sides, divide diameter in half the number and draw from H through each division. Join any two points where they cut the circumference, and the chord so drawn will be the side. To do the same (Fig. 2) when each side is to be a definite length: Divide 360° by the number of sides in polygon, deduct the

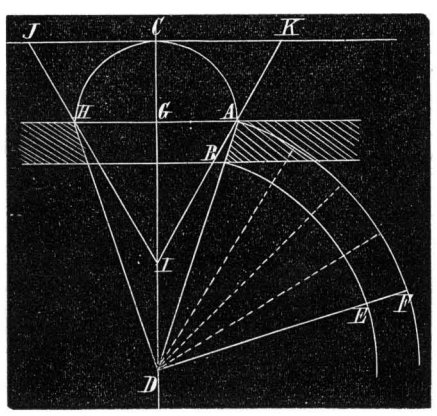


quotient from 180°, the remainder will be the number of degrees in each polygon; at the points, A and B, one inch or whatever length you wish for a side apart make the angles, O A B or O B A, each equal to half the angle of the polygon; from O as a center, with O A or O B as radius, describe a circle, in which place A B continually.

(41) M D. asks: Can you inform me what colors or combinations of ingredients I must use to produce a silver color, like silver leaf, on leather? A. Try the bisulphide of tin. Apply with a hot iron.

(42) W. C. asks: Will dry steam, taken from a generator, at 100 lbs. pressure, passing into water in a closed boiler, the blow-off valve being set at 80 lbs., evaporate that water, or will the steam from generator condense and increase the quantity in closed boiler? A. After the water is heated up to the temperature due to the pressure, the steam would merely escape through the blow-off valve.

(43) S. S. H. says: 1. I have a window, the head of which is circular, and the inside casing is on the splay. Is there a rule by which I could cut out a board to bend around it, and make the marks across it so that I can saw-kerf it? A. We presume you have reference to the splayed soffit of your jamb instead of the casing. Let A B be the width and splay of the jamb, and C D a line drawn through the middle of the window, at right



angles to the direction of the wall. Prolong A B to intersect C D at D. With D A for radius, draw the arc, A F, and with D B for radius draw the arc, B E. With G H for radius, draw the semicircle, H C A. Make H I and A I each equal to H A, and from I, through A and through H, draw the lines, I J and I K. Make A F equal to J K, and join F and D. Then A F E B will be the shape of the soffit required. 2. What is a transom? Is it what is called the fanlight over the door, or is it the rail across the head of the door? A. The latter.

(44) F. S. B. asks: Please give me a recipe for cleaning white rubber coats. A. Try rubbing the coat with a little benzine, but do not allow it to remain too long in contact with the rubber. You fail to state with what the material has become stained.

(45) I. H. W., of Ouchy, Switzerland, says: Why is it that many (perhaps all) liquids will percolate more rapidly through two than one thickness of filtering paper? My theory is that, with one thickness, the paper, becoming saturated, adheres to the funnel sides, and checks the circulation of air, whereas, when two thicknesses are used, a circulation is established between the papers themselves. Am I correct? A. Yes.

(46) C. F. M. asks: What is the strongest and best kind of alkali for bleaching oil? A. Use a strong solution of caustic potassa or soda in water.

(47) M. asks: What is a good plan for compressing air on a small scale? A. Try a small air pump or bellows.

(48) W. B. W. asks: What acid will do to bite figures, etc., in mica? A. Try a mixture of strong sulphuric and hydrofluoric acid.

(49) W. L. asks: In casting gun metal or hard brass upon a smooth iron surface, or chill, what is the best coating or parting to put on the iron in order that the gun metal may form a smooth surface in close contact to the iron, without any blow holes? A. Use plumbago for a parting and dry the mold.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. W. R.—It is decomposed granite, and the shining scales are small pieces of weathered mica. —H. A. B. Jr.—You are mistaken in supposing the specimen is an ore. It is composed of quartz, mica, and the black portion of hornblende, which is a silicate of alumina, lime, etc, and some oxide of iron.—A. W. S.—No. 1 is silex, alumina, and a small percentage of hydrated oxide of iron. No. 2 is earth containing scales of mica. No. 3 is silex and oxide of iron. No. 4 is silicate of alumina with oxide of iron. The percentage is so small that they are not to be considered as iron ores.—T. L.—No. 1 is graphite (black lead). No. 2 is mostly iron pyrites, but you should send a larger piece and have it assayed.—G. C. R.—It is the American holly (*ilex opaca*). The deep green foliage is less glossy than that of the European holly. —R. W. B.—It is Epsom salts, as you have stated. The discovery is of the greatest interest and value.—B. M. R.—It is a small fragment of fossil, with clay and oxide of iron.—G. S. M.—It consists mesily of silex with silicates of lime, magnesia, and alumina. It is not of much value.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Footprints in the Carboniferous Sandstone By J. L. G.
On a Day's Work. By E. L.
On Saving Life. By M. P.
On Supply and Demand. By W. L.
On the Newfoundland Railway. By H. A. C.
On Machinery and Labor. By W. P.
On Type-Setting Machines. By T. E. A.

Also inquiries and answers from the following:
J. P. S.—P. D.—A. H. L.—W. T. H.—R. L. D.—B. B. —F. H. W.—O. N. S.—B. B.—W. A. R.—W. S. T.—W. E. F.—H.—W. S. G.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes toughened glass? Who sells machinery for manufacturing starch? Who sells incubators? Who sells hydraulic rams? Who makes the machines used in the manufacture of friction matches?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 28, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specification and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city.

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Yoke, ox, J. Q. Collins	175,428

DESIGNS PATENTED.

9,163, 9,164.—EMBROIDERY.—E. Crisand, New Haven, Ct.
9,165.—CLOCK CASES.—E. J. Farnum, Sing Sing, N. Y.
9,166.—STOVE.—C. Harris *et al.*, Cincinnati, O.
9,167.—TYPE.—J. K. Rogers, Brookline, Mass.
9,168.—BADGE.—W. Scully *et al.*, St. Paul, Minn.
9,169.—SHIELD.—A. Weidmann, New York city.
9,170.—SHAWLS.—E. G. Andrae, Philadelphia, Pa.
9,171.—FLAG HOLDER.—E. Cundey, Philadelphia, Pa.
9,172.—CIGARS.—R Geilhausen, Red Oak, Iowa.
9,173, 9,174.—BASINS.—W. Tweeddale, Brooklyn, N. Y.

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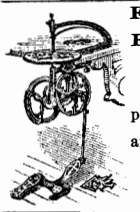

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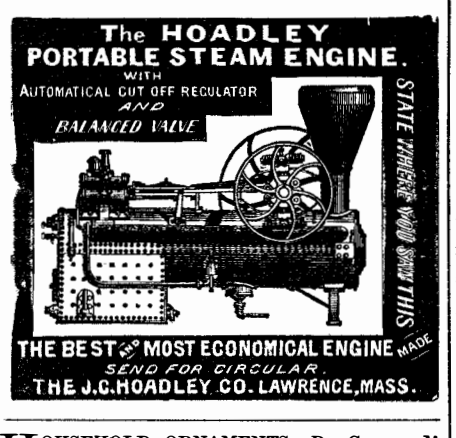

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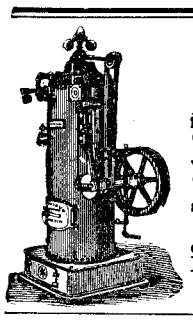

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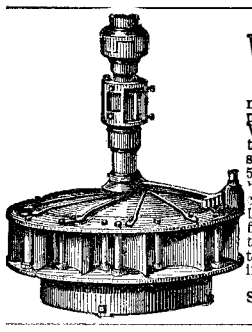

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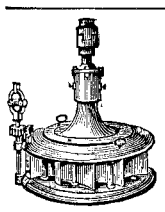

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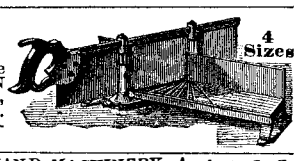

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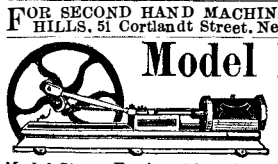

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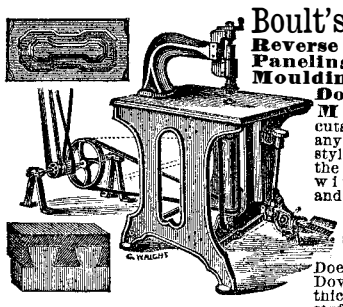

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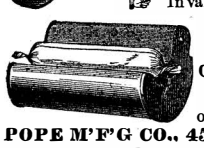

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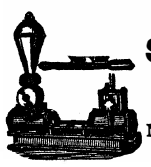

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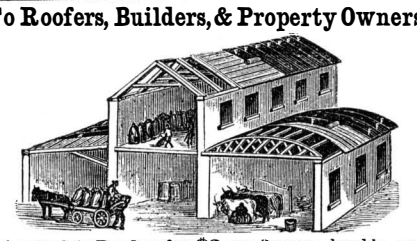

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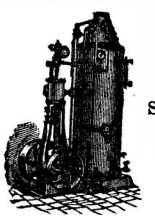

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